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SELECTED
 WATER
RESOURCES
ABSTRACTS



VOLUME 6, NUMBER 7
APRIL 1, 1973

W73-03901 -- W73-04550



SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED WATER RESOURCES ABSTRACTS

Selected Water Resources Abstracts is a monthly journal containing abstracts

**A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior**

This publication contains abstracts of research papers, reports, and other materials in engineering and basic aspects of the characteristics, conservation, control, and management of water which serve either as the basis for technical papers and/or as a source of information for papers which have been listed in the Water Resources Thesaurus. Each abstract entry is identified with two terms and key words similar to the seven resources-research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

Volume 6 and Periodicity: In A POSITION TO PROTECT AND USE THE
NATIONAL CAPABILITY TO USE RENEWABLE WATER RESOURCES IN AN ECONOMIC
AND ENVIRONMENTALLY SOUND MANNER, THE SECRETARY OF THE INTERIOR HAS DETERMINED THAT THE SEMIMONTHLY PUBLICATION OF THE WATER RESOURCES ABSTRACTS IS NECESSARY FOR THE MAINTENANCE OF THE NATIONAL CAPABILITY TO USE RENEWABLE WATER RESOURCES IN AN ECONOMIC AND ENVIRONMENTALLY SOUND MANNER. THE COUNCIL FOR SCIENCE AND TECHNOLOGY HAS BEEN DESIGNATED AS THE NATIONAL COMMITTEE FOR SCIENCE AND TECHNOLOGY.

The Office of Water Resources Research is publishing this periodical to assist in coordinating and disseminating the results of scientific and technical research associated with the comprehensive development program of water resources.



Published quarterly by the Office of Water Resources Research, U.S. Department of the Interior, Washington, D.C. A portion of the cost of publication is being paid by the U.S. Public Health Service.

VOLUME 6, NUMBER 7
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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1973.

SELECTED

WATER RESOURCES ABSTRACTS

Abstracts of selected publications on water resources, prepared by the U.S. Geological Survey, U.S. Department of the Interior.

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States—now and in the future.



U.S. DEPARTMENT OF THE
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FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus**. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by co-ordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

SELECTED WATER RESOURCES ABSTRACTS

CONTENTS

1A. Preprints

FOREWORD

iii

SUBJECT FIELDS AND GROUPS

(Use Edge Index on back cover to Locate Subject Fields and Indexes in the journal.)

01 NATURE OF WATER

Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Non-Water Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

Center has agreements becomes the information base from which this journal is, and other information services will be derived; these services include bibliographies, specialized indices, literature searches, and statistical services.

Comments and suggestions concerning USES Center arrangements may be sent to the Director, USES Center, Washington, D.C. 20415.

has agreed to provide the USES Center with the information base from which this journal is, and other information services will be derived; these services include bibliographies, specialized indices, literature searches, and statistical services.

06 WATER RESOURCES PLANNING

Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA

Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

08 ENGINEERING WORKS

Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.

09 MANPOWER, GRANTS AND FACILITIES

Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.

10 SCIENTIFIC AND TECHNICAL INFORMATION

Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.

SUBJECT INDEX

AUTHOR INDEX

ORGANIZATIONAL INDEX

ACCESSION NUMBER INDEX

ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

01. NATURE OF WATER

1A. Properties

THE STRUCTURE OF LIQUID WATER,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 02K.
W73-03903

1B. Aqueous Solutions and Suspensions

THE STRUCTURE OF LIQUID WATER,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 02K.
W73-03903

RHEOLOGY OF FRICTION-REDUCING POLYMER SOLUTIONS,
California State Coll. Los Angeles. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 06B.
W73-03913

A RAPID METHOD OF MEASUREMENT OF DIFFUSION COEFFICIENTS IN AQUEOUS SOLUTIONS,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 02K.
W73-03966

02. WATER CYCLE

2A. General

SHEET FLOW UNDER SIMULATED RAINFALL,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02B.
W73-03921

STOCHASTIC ANALYSIS OF MONTHLY FLOW DATA APPLICATION TO LOWER OHIO RIVER TRIBUTARIES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W73-04063

SENSITIVITY OF GROUNDWATER FLOW MODELS TO VERTICAL VARIABILITY OF AQUIFER CONSTANTS,
Oklahoma Water Resources Research Inst., Stillwater.
For primary bibliographic entry see Field 02F.
W73-04065

INVESTIGATION AND CALCULATION OF COMPONENTS IN THE HYDROLOGIC REGIME OF RIVERS (ISSLEDOVANIYA I RASCHETY ELEMENTOV GIDROLOGICHESKOGO REZHIMA REK),
Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02E.
W73-04111

HYDROLOGIC STUDIES IN NORTHERN ALGERIA (O GIDROLOGICHESKOY I ZUCHENOSTI TERRITORII SEVERNOGO ALZHIRA),
Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).

For primary bibliographic entry see Field 02E.
W73-04120

STABILITY AND THE CONSERVATION OF MASS IN DRAINAGE BASIN EVOLUTION,
University of Western Ontario, London. Dept. of Geography.
T. R. Smith, and F. P. Bretherton.
Water Resources Research, Vol 8, No 6, p 1506-1529, December 1972. 6 fig, 24 ref.

Descriptors: *Geomorphology, *Mathematical models, Topography, Valleys, Erosion, Land forming, Sediment transport, Rainfall-runoff relationships, Open channel flow, Horton's law.

Drainage basin evolution is modeled as the time development of an initial surface subject to conservation of sediment and water and a transport law $q_S \pm F(S, q)$ connecting the sediment flux q_S with the local slope S and the discharge of surface water q . Two models are presented. The first is appropriate to a smooth surface on which no discrete channels have formed, and the second is appropriate to a family of V-shaped valleys, each containing a separate stream of negligible width. For the first model, some solutions are presented that describe the evolution of a long ridge for which the profile is independent of one spatial coordinate. The stability of such surfaces is then discussed. It is shown that, if $F/q < dF/dq$, disturbances of small amplitude and small lateral scale will grow rapidly and presumably will lead to the formation of closely spaced channels directed down the slope, whereas, if $F/q > dF/dq$, such channels will tend to disappear. For a surface eroding without change of shape, convex portions are stable, and concave segments are unstable. It is shown how, in the second model, if each stream moves so that the sediment fluxes entering from its two side slopes remain equal, a system of similar parallel valleys is unstable, and neighbors will tend to coalesce on a time scale comparable to that for erosion through a layer as thick as a valley is deep. (Knapp-USGS)
W73-04202

RAINFALL AND RUNOFF IN URBAN AREAS--A CASE STUDY OF FLOODING IN THE PIEDMONT OF NORTH CAROLINA,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 04C.
W73-04356

RAINFALL AND RUNOFF IN URBAN AREAS: THEORY AND PREDICTION,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04C.
W73-04357

PROPERTIES OF THE KERNELS FOR TIME INVARIANT, INITIALLY RELAXED, SECOND ORDER, SURFACE RUNOFF SYSTEMS,
M. H. Diskin, and A. Boneh.
Journal of Hydrology, Vol 17, No 1-2, p 115-141, October 1972. 9 fig, 8 ref.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, Systems analysis, Input-output analysis, Unit hydrographs, Streamflow forecasting, Time series analysis.

The surface runoff system relating direct surface runoff to rainfall excess is modeled as nonlinear. The nonlinear relationship between input and output to the system can be described by a Volterra series, which is a sum of generalized convolution integrals. Adopting the first two terms of the series defines a second order model, comprising of a linear subsystem and a second order subsystem. Each of the subsystems is characterized by a kernel function. The properties that the kernels must

fulfill as a result of the definition of the system are derived and presented. The properties of the first order kernel are identical to those of the instantaneous unit hydrograph (IUH), which is the kernel for a strictly linear system. For the second order kernel, the surface integral of the kernel function over its plane of definition must be zero. The integral of the function along any line parallel to the main diagonal must be zero. This means that the output of the second order subsystem (resulting from short duration inputs) is negative for some intervals of time. To avoid negative total output it must be assumed that the inputs to the system should have an upper bound. As example of a surface runoff system based on a possible second order kernel function having the desired properties is included. The corresponding upper bound on the input to this system is also presented. (Knapp-USGS)
W73-04371

AN INDEX OF FLOOD-PRODUCING RAINFALL BASED ON RAINFALL AND SOIL MOISTURE DEFICIT,
Institute of Hydrology, Wallingford (England).
Floods Study Team.
M. A. Beran, and J. V. Sutcliffe.
Journal of Hydrology, Vol 17, No 3, p 229-236, November 1972. 1 fig, 8 ref.

Descriptors: *Rainfall-runoff relationships, *Runoff forecasting, *Flood forecasting, *Precipitation excess, Soil moisture, Statistical methods, Distribution patterns, Water balance, Effective precipitation.
Identifiers: England.

A simple index of flood producing rainfall, called rainfall excess, is based on daily rainfall and on soil moisture deficit data computed by the British Meteorological Office. It is intended for use as a predicting variable in estimating the magnitude and frequency of floods at ungaged sites. At any location and in any season the rainfall excess of a T year return period differs from the rainfall of the same return period by a constant amount, which is the same for all values of T. This constant amount can be viewed as a mean soil moisture deficit for the given location and season. Seasonal maps of mean soil moisture deficit can be prepared and used in conjunction with rainfall statistics to provide immediately an index of flood-producing rainfall. This convenient result, the subtractive property of the mean soil moisture deficit, derives from a property of the exponential distribution used to describe the distribution of daily rainfall data. (Knapp-USGS)
W73-04528

INTERCEPTION OF RAIN BY FOREST VEGETATION-ESTIMATION OF DAILY INTERCEPTION USING A MATHEMATICAL MODEL (INTERCEPTION DE LA PLUIE PAR LA VEGETATION FORESTIERE-ESTIMATION DE L'INTERCEPTION JOURNALEIRE A L'AIDE D'UN MODELE MATHEMATIQUE),
Institut Royal Meteorologique de Belgique, Brussels.
F. Bultot, G. L. Dupriez, and A. Bodeaux.
Journal of Hydrology, Vol 17, No 3, p 193-223, November 1972. 8 fig, 3 tab, 3 ref.

Descriptors: *Interception, *Evaporation, *Water balance, *Mathematical models, Throughfall, Evapotranspiration, Infiltration, Water loss, Rainfall intensity, Forests.

On basis of observations made in a spruce forest and in a beech forest a relation between intercepted water, rainfall, rain intensity, and evaporating power of the air was derived. A mathematical model was developed in order to calculate day to day computation of the potential and

Field 02—WATER CYCLE

Group 2A—General

real interception, the amount of water remaining in the canopy, throughfall, evaporation of intercepted precipitation, and potential evapotranspiration. (Knapp-USGS)
W73-04530

THE OUTPUT OF A LOWLAND CATCHMENT,
Amsterdam Univ. (Netherlands).
For primary bibliographic entry see Field 03B.
W73-04533

THE OHIO STATE UNIVERSITY VERSION OF THE STANFORD STREAMFLOW SIMULATION MODEL: PART I - TECHNICAL ASPECTS,
Ohio State Univ., Columbus. Dept. of Civil Engineering.

V. T. Ricca.

Ohio Water Resources Center Technical Report, May 1972. 144 p., 30 fig., 9 tab., 15 ref. OWRR B-005-OHIO (10) and B-019-OHIO (3). 14-31-0001-3115.

Descriptors: *Model studies, *Computer models, *Streamflow forecasting, Evapotranspiration, Hydrograph analysis, Sedimentary basins, Snowmelt, Time of concentration, *Small watersheds, Agricultural watersheds, *Ohio.

Identifiers: *Stanford streamflow model, *Ohio State University.

Research with the Stanford Streamflow Simulation model has been performed along these lines, starting with the University of Kentucky version of a detailed expose and computer flow charting of the model was written; the model was applied to small agricultural watersheds as a basis for a sensitivity study of the major variable input parameters; and a subroutine was developed for superimposed machine plotting of the hydrographs. Efforts to improve the model were as follows: modification of the time of concentration increments to handle small (approx. 100 acre) watersheds; development of a snowmelt subroutine for climatological conditions unique to the Midwest region; expansion of the model to accommodate multiple groundwater recession constants for basins with a stratified geology; inclusion of swamps and soil crack storage consideration; and machine plotting of hydrographs to accompany the hydrograph plots. All modifications have been tested with the data of the USDA North Appalachian Experimental Watershed at Coshocton, Ohio, with reasonably good results. The salient features of these modifications and their application are reported. (See also W73-04543 and W73-04544)

W73-04542

THE OHIO STATE UNIVERSITY VERSION OF THE STANFORD STREAMFLOW SIMULATION MODEL: PART II—THE COMPUTER PROGRAM,
Ohio State Univ., Columbus. Dept. of Civil Engineering.

V. T. Ricca.

Ohio Water Resources Center Technical Report, August 1972. 59 p., 2 fig. OWRR B-005-OHIO (11) and B-019-OHIO (4).

Descriptors: *Model studies, *Streamflow forecasting, *Computer models, *Small watersheds, *Ohio, Computer programs, Hydrology, Evapotranspiration, Hydrograph analysis, Sedimentary basins (Geologic), Input-output analysis, Systems analysis, Agricultural watersheds.

Identifiers: *Stanford streamflow model, *Ohio State University.

This program is from a portion of a research project, 'Hydrologic Investigations of Small Watersheds in Ohio'. The technical aspects of and the evolution of the Ohio State University version of the Stanford Streamflow Simulation Model

have been presented in a separate report—Part I. Part II is the computer program for the model. To facilitate understanding the program structure, an overall flow diagram was drawn. Next, a dictionary listing of the program variables is given. Finally, a photocopy of the actual operating computer program printout is presented. (See also W73-04542 and W73-04544) (Woodard-USGS)
W73-04543

THE OHIO STATE UNIVERSITY VERSION OF THE STANFORD STREAMFLOW SIMULATION MODEL: PART III—USER'S MANUAL,
Ohio State Univ., Columbus. Dept. of Civil Engineering.

V. T. Ricca, and J. C. Warns.

Ohio Water Resources Center Technical Report, August 1972. 86 p., 8 fig., 6 tab., 59 ref. OWRR B-005-OHIO (18) and B-019-OHIO (5).

Descriptors: *Model studies, *Streamflow forecasting, *Computer models, *Small watersheds, *Ohio, Computer programs, Agricultural watersheds, Hydrology, Evapotranspiration, Hydrograph analysis, Sedimentary basins (Geologic), Snowmelt, Time of concentration, Systems analysis, Input-output analysis.

Identifiers: *Stanford streamflow model, *Ohio State University.

This manual was written as a portion of a research project, 'Hydrologic Investigations of Small Watersheds in Ohio'. Report Parts I and II of this project presented the technical aspects and computer program for the Ohio State University version of the Stanford Streamflow Simulation Model. Part III gives the potential model user a working understanding of the model so that he can use it efficiently and effectively as a tool in hydrologic investigations. (See also W73-04542 and W73-04543) (Woodard-USGS)
W73-04544

2B. Precipitation

NEBRASKA DROUGHTS: A STUDY OF THEIR PAST CHRONOLOGICAL AND SPATIAL EXTENT WITH IMPLICATIONS FOR THE FUTURE,
Nebraska Univ., Lincoln. Dept. of Geography.

M. P. Lawson, A. Reiss, R. Phillips, and K. Livingston.

Available from the National Technical Information Service as PB-214 093, \$3.00 in paper copy, \$0.95 in microfiche. Occasional Paper No. 1, 1971. 147 p., 5 fig., 23 tab., 47 maps, 39 ref. OWRR A-018-NEB (1).

Descriptors: *Droughts, *Mapping, *Nebraska, *Dendrochronology, Great Plains, Irrigation, Weather, Correlation analysis, Human population, Rural areas.

Identifiers: *Dendroclimatology, *Correspondence mapping, Rural population.

The purpose was to measure the spatial and temporal dimensions of drought occurrence in Nebraska. Such interpretations were facilitated by the computer generation of 468 maps showing monthly values of drought in Nebraska, from 1931 through 1969. While it was found that the frequency of consecutive drought is least in the central portion of the state, the intensity of drought is greatest in this region. Maps of correspondence which relate the areal correlation between rural population density and precipitation also indicate high positive relationships for central Nebraska. Interpretation of tree ring growth values using moving t-test plots did not demonstrate the cyclical recurrence of drought. A short review was conducted as to the economic and climatic impact of irrigation on future droughts in Nebraska.

W73-03907

SHEET FLOW UNDER SIMULATED RAIN-FALL,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
Ruh-Ming Li.
M Sc Thesis, April 1972. 111 p., 28 fig., 11 tab., 34 ref., 4 append. OWRR B-014-COLO (5) 14-01-0001-1435.

Descriptors: *Rainfall, *Sheet flow, *Statistical analysis, *Regression analysis, *Rainfall-runoff relationships, Mathematical studies, Equations, Numerical analysis, Forecasting, Correlation analysis, Hydrologic data, Reynolds number, Analytical techniques, Flow rates.

The effect of rainfall on sheet flow can be very significant due to the thin water depth involved. The variation of friction factor is established for different flow and rainfall conditions by statistical analysis of all available data with direct measurement of boundary shear stress by hot-film anemometry. The friction factor is a function of both the flow Reynolds number and the rainfall intensity for a flow Reynolds number of less than 900. For a flow Reynolds number greater than 2000, the friction factor is only a function of Reynolds number. A set of regression curves for the variation of the Darcy-Weisbach friction coefficient with rainfall intensity and Reynolds number is determined. The effects of uncertainties in determining the friction factor on flow depths and boundary shear stresses are not too sensitive and these errors are not cumulative with computation steps. A numerical model was developed to predict the flow depths and boundary shear stresses. Good agreements were found between predicted values and measured values. A simplified procedure to estimate these mean flow properties was successfully developed for engineering practical use. (Woodard-USGS)
W73-03921

ON THE CORRELATION OF THE TOTAL PRECIPITABLE WATER IN A VERTICAL COLUMN AND ABSOLUTE HUMIDITY AT THE SURFACE,
Aerospace Corp., El Segundo, Calif.

E. E. Reber, and J. R. Swope.

Available from NTIS, Springfield, Va 22151 as AD-745 954 - Price \$3.00 printed copy; \$0.95 cents microfiche. Aerospace Corporation Report No TR-0172 (2230-20)-13 (Air Force Report No SAMSO-TR-72-163), April 15, 1972. 17 p., 7 fig., 7 ref. USAF Contract F04701-71-C-0172.

Descriptors: *Precipitable water, *Humidity, *Correlation analysis, *Precipitation (Atmospheric), *Analytical techniques, Meteorology, Water vapor, Moisture content, Atmosphere, California, Climates.

The relationship between the total precipitable water in the atmosphere and surface absolute humidity was examined for more than 1500 upper-level soundings. Total precipitable water and surface absolute humidity were computed for all of the upper-level soundings made in 1970 at San Nicolas Island, Point Mugu, and China Lake, California. These stations, separated by less than 200 mi, are representative of a maritime, a coastal, and a desert environment, respectively. The monthly correlation coefficients, ranging from -0.25 to +0.85, indicate that a direct but widely variable relationship exists between the total precipitable water and surface absolute humidity; however, these results also demonstrate that estimates of total precipitable water from surface humidity measurements are not valid. When an accurate assessment of the precipitable water is required, there is no satisfactory substitute for direct measurements. Precipitable water can be computed from the data of upper-air soundings or measured directly at any location on a cloud-free path between the observation point and the sun by means of a spectral hygrometer. (Woodard-USGS)
W73-03923

WATER CYCLE—Field 02

Snow, Ice, and Frost—Group 2C

THE POSSIBILITY OF ESTIMATING THE SOIL MOISTURE RESERVE FROM PRECIPITATION DATA (IN RUSSIAN)

A. R. Konstantinov, and S. B. Krasuk.

Ts Ukr Nauchno-Issled Gidrometeorol Inst. 90, p 109-115. 1970.

Identifiers: Forests, Moisture, *Precipitation, Reserve, *Soil moisture, Steppe, USSR.

Data on monthly reserves of productive moisture in soils and meteorological factors in the forest steppe and steppes parts of the Ukrainian SSR were examined. Coefficients of correlation were calculated in relation to the date, total atmospheric precipitation and the time of year; 'weights' of precipitation participating in the formation of moisture reserves were determined. From the data, graphs expressing the correlation between the calculated and actual moisture reserves were constructed. With these graphs, the moisture reserve for a given specific month from the total precipitation of the last 4 mo. may be determined. This method involves an error of 8-12 mm for the spring and summer months and 11-16 mm for the fall and winter months.—Copyright 1972, Biological Abstracts, Inc.

W73-04019

STUDY OF RAINOUT OF RADIOACTIVITY IN ILLINOIS.

Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 05B.

W73-04052

DYNAMICS OF THE SOIL-WATER SYSTEM DURING A RAINSTORM,

Agricultural Research Service, St Paul, Minn. Soil and Water Conservation Research Div.

For primary bibliographic entry see Field 02G.

W73-04107

OBSERVATIONS OF RADIORUTHENIUM AND RADIOCERIUM ISOTOPIC ACTIVITY RATIOS IN RAIN WATER,

Radiation Center of Osaka Prefecture, Osaka (Japan).

For primary bibliographic entry see Field 05A.

W73-04313

LITERATURE SEARCH FOR ATMOSPHERIC HUMIDITY PROFILE MODELS FROM THE SEA SURFACE TO 1,000 METERS,

National Oceanographic Data Center, Rockville, Md.

For primary bibliographic entry see Field 07C.

W73-04332

USE OF SURFACE OBSERVATIONS IN BOUNDARY-LAYER ANALYSIS,

National Weather Service, Silver Spring, Md.

For primary bibliographic entry see Field 07C.

W73-04333

LICHENOMETRIC INDICATION OF THE TIME OF EXPOSURE OF A ROCK SUBSTRATE, (IN RUSSIAN),

Akademiya Nauk Estoneskoi SSSR, Tallinn. Tallinn Botanical Garden.

For primary bibliographic entry see Field 07B.

W73-04334

THE URBAN CLIMATE,

Kentucky Univ., Lexington. Dept. of Geography.

For primary bibliographic entry see Field 04C.

W73-04355

RAINFALL AND RUNOFF IN URBAN AREAS—A CASE STUDY OF FLOODING IN THE PIEDMONT OF NORTH CAROLINA,

Geological Survey, Raleigh, N.C.

For primary bibliographic entry see Field 04C.

W73-04356

RAINFALL AND RUNOFF IN URBAN AREAS: THEORY AND PREDICTION,

Kentucky Univ., Lexington. Dept. of Agricultural Engineering.

For primary bibliographic entry see Field 04C.

W73-04357

SOME SINGLE- AND MULTI-SITE MODELS OF RAINFALL WITHIN DISCRETE TIME INCREMENTS,

Water Research Association, Marlow (England).

J. A. Cole, and J. D. F. Sheriff.

Journal of Hydrology, Vol 17, No 1-2, p 97-113, October 1972. 2 fig, 6 tab, 34 ref.

Descriptors: *Rainfall, *Distribution patterns, *Mathematical models, Probability, Reviews, Markov processes, Stochastic processes, Depth-area-duration analysis, Rainfall disposition, Variability, Statistics, Statistical methods, Statistical models.

Daily rainfall at one site is modeled in two stages: first by random selection of duration of alternating wet and dry spells and secondly, by a Markov chain of daily rainfall amounts within each wet spell. Extension of the single-site sequence to other sites may be done by sampling from historical patterns but is better achieved by using multivariate versions of the Markov chain. A 'magic carpet' rainfall model offers an alternative multi-site generation process, which combines stochastic storm occurrences with deterministic evolution of individual storms and preset motions across a river basin. (Knapp-USGS)
W73-04372

SPATIAL ANALYSIS OF RAINFALL DATA FROM DENSE NETWORKS,

Hebrew Univ., Jerusalem (Israel).

For primary bibliographic entry see Field 07C.

W73-04383

CALCULATION OF AREAL RAINFALL USING FINITE ELEMENT TECHNIQUES WITH ALTIMETRICAL CORRECTIONS,

For primary bibliographic entry see Field 07C.

W73-04385

CHEMICAL COMPOSITION OF ATMOSPHERIC PRECIPITATION IN THE DEPUTATS'KIY REGION (Khimicheskii sostav atmosfernykh vypadayushchikh na territorii Deputats'kogo Rayona),

Osadkov, Vypadayushchikh na territorii Deputats'kogo Rayona), Moscow State Univ. (USSR). Kafedra Merzlotovedeniya.

V. P. Volkova.

Vestnik Moskovskogo Universiteta, Seriya IV, Geologiya, No 4, p 97-100, July-August 1972. 2 fig, 2 tab.

Descriptors: *Precipitation (Atmospheric), *Rain, *Snow, *Meteorite water, *Water chemistry, Water quality, Water analysis, Chemical analysis, Sampling, Trace elements, Inorganic compounds, Salts, Ions, Solutes, Seasonal.

Identifiers: USSR, *Yakutsk ASSR, Hydrosphere, Mineralization.

Over 50 samples of rain and snow were collected and analyzed during a small-scale hydrogeological survey conducted in 1967-70 by the Yakutsk expedition of Moscow State University in a 19,500 sq km area near the Deputats'kiy settlement in northeast Yakutsk ASSR. Annual precipitation in the area varies between 230 and 480 mm. The pH of the meteoric waters is 5.0-6.5, and mineralization varies between 0.009 and 0.064 g/liter. Meteoric waters containing bicarbonate and chloride make up 34% of all samples analyzed. From a

spectral analysis of 20 dry residues, 27 trace constituents were determined, including beryllium, arsenic, phosphorus, antimony, lead, tin, copper, silver, zinc, cobalt, nickel, zirconium, molybdenum, bismuth, gallium, chromium, and vanadium. (Josephson-USGS)

W73-04511

THE SPOTTINESS OF RAINFALL IN A DESERT AREA,

Hebrew Univ., Jerusalem (Israel).

D. Sharon.

Journal of Hydrology, Vol 17, No 3, p 161-175, November 1972. 5 fig, 6 tab, 11 ref.

Descriptors: *Rainfall disposition, *Distribution patterns, *Arid lands, Correlation analysis, Variability, Rainfall intensity, Weather, Meteorology, Synoptic analysis.

Identifiers: Israel.

Between one-half and two-thirds of the total rainfall in the southernmost arid part of Israel is of a highly localized type, coming mostly from small convective cells. In a number of storms, the dimensions of such cells could be estimated; the typical diameter was about 5 km. Larger localized systems exist as well. In the instances observed, cells mostly appeared well-separated from each other, both in time and space. Consequently, in a region (or watershed) of a few hundreds of sq km, the proportion of the area receiving intensive rainfall on a given day may be as low as 20%. The area covered by individual cells seems to be randomly distributed in space, as long-term average rainfall is uniform throughout the region considered. The number of days on which rain occurs somewhere within that region is about 50% higher than the number recorded at any single-point. Seasonal differences were also found. Spottiness is most pronounced in the fall and late spring, whereas spatially uniform rainfall is most likely to occur in midwinter. (Knapp-USGS)
W73-04532

2C. Snow, Ice, and Frost

RADAR CROSS-SECTION MEASUREMENTS OF SNOW AND ICE,

Cold Regions Research and Engineering Lab., Hanover, N.H.

P. Hoekstra, and D. Spanogle.

Technical Report 233, November 1972. 37 p, 31 fig, 11 tab, 9 ref.

Descriptors: *Snow surveys, *Snow cover, *Ice lakes, *Radar, Measurement, Data collections, Cross-sections, Snow, Ice, Depth, Temperature, Density.

Identifiers: Backscatter, Terrain avoidance system.

As part of an Advanced Research Projects Agency program to develop a surface effect vehicle for use in the Arctic, measurements of the backscatter from snow and ice surfaces were obtained for the design of a terrain avoidance system. The measurements were made on a snow and ice covered lake in Lyme, New Hampshire. The radars were placed on the shore at the edge of the lake. The distance to the shore on the other side of the lake was 2000 ft. The depth of the snow overlying the fresh-water ice varied from 0 to 12 inch and the state of the snow varied from dry, loose powder to wet slush. The state of the snow cover was recorded daily during the radar experiments. Measurements were made of snow depth, snow temperature and snow density. The radar cross-section of ice blocks placed on the snow surface was roughly proportional to the square of the area of the ice blocks facing the radar at 10 and 35 GHz and was about 20 dBm below the return expected for a perfectly reflecting plane surface. At 95 GHz the ice blocks became diffuse reflectors. (Woodard-USGS)

Field 02—WATER CYCLE

Group 2C—Snow, Ice, and Frost

W73-03920

WATER PRESSURE IN INTRAGLACIAL CHANNELS.
H. Rothlisberger.
Journal of Glaciology, Vol 11, No 62, p 177-203, 1972. 11 fig, 1 tab, 24 ref.

Descriptors: *Glaciohydrology, *Melt water, *Glaciers, *Streamflow, *Percolation, Open channel flow, Closed conduit flow, Hydraulics, Karst hydrology.
Identifiers: *Subglacial streams.

Water flowing in tubular channels inside a glacier produces frictional heat, which causes melting of the ice walls. However the channels also have a tendency to close under the overburden pressure. Using the equilibrium equation that at every cross-section as much ice is melted as flows in, differential equations are given for steady flow in horizontal, inclined and vertical channels at variable depth and for variable discharge, ice properties and channel roughness. The pressure decreases with increasing discharge, which proves that water must flow in main arteries. The same argument is used to show that certain glacier lakes above long flat valley glaciers must form in times of low discharge and empty when the discharge is high, when the water head in the subglacial drainage system drops below the lake level. Under the conditions of the model an ice mass of uniform thickness does not float, that is, there is no water layer at the bottom, when the bed is inclined in the down-hill direction, but it can float on a horizontal bed if the exponent of the law for the ice creep is small. Basal streams (bottom conduits) and lateral streams at the hydraulic grade line can coexist. Computations have been carried out for the Gornergletscher where the bed topography is known and where some data are available on subglacial water pressure. (Knapp-USGS)

W73-03927

FINITE-ELEMENT STRESS ANALYSIS OF AVALANCHE SNOWPACKS,
Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
F. W. Smith, R. A. Sommerfeld, and R. O. Bailey.
Journal of Glaciology, Vol 10, No 60, p 401-405, 1971. 4 fig, 4 ref.

Descriptors: *Snowpacks, *Stress analysis, *Finite element analysis, *Avalanches, Equations, Slopes, Analytical techniques, Mathematical studies, Tensile stress, Colorado.

The elastic stresses have been determined, in a single-layer homogeneous snowpack on a realistic avalanche slope, by a two-dimensional finite-element analysis. Calculation of the state of stress throughout the 0.96 m snow layer on a slope approximately that of the Lift Gully at Berthoud Pass, Colorado, resulted in reasonable stress values. In particular, both field experience and the calculated shear stresses predict avalanching in the lower-density snows. Also, tensile stresses were present only in the area of the observed fracture line. (Woodard-USGS)

W73-03928

ELECTRONIC DETECTION OF SERAC AVALANCHES AND GLACIER NOISE AT VAUGHAN LEWIS ICEFALL, ALASKA,
Case Western Reserve Univ., Cleveland, Ohio.
A. C. Pinchak.
Journal of Glaciology, Vol 11, No 62, p 279-281, 1972. 2 fig, 4 ref.

Descriptors: *Avalanches, *Glaciers, Movement, *Hydrophones, Seismographs, Instrumentation, Equipment, Acoustics, Sound waves, Melt water, *Alaska.
Identifiers: *Ice falls, *Vaughan Lewis Icefall (Ala).

A simple, inexpensive, light-weight hydrophone-amplifier-tape-recorder system is capable of detecting serac avalanches in an ice fall. In addition, the system is capable of recording noise related to glacier flow and deformation as well as hydrological phenomena in the supra glacial melt water. (Knapp-USGS)
W73-03929

GRAIN-BOUNDARY ENERGY AND GRAIN-BOUNDARY GROOVE ANGLES IN ICE,
Hokkaido Univ., Sapporo (Japan). Inst. of Low Temperature Science.
S. Suzuki, and D. Kuroiwa.
Journal of Glaciology, Vol 11, No 62, p 265-277, 1972. 12 fig, 10 ref.

Descriptors: *Cryology, *Ice, *Crystallography, Crystal growth, Growth rates, Firn, Snow.
Identifiers: *Grain-boundary energy (Ice).

Relative grain-boundary energies in ice were measured as a function of mismatch angles made by the c-axes or a-axes in grains, using ice specimens having triple grain boundaries. The Read-Shockley equation for grain-boundary energy was valid for grain boundaries tilted between 0 deg and 15 deg. Angles of the solid-vapor grain-boundary groove in ice were measured by the use of microinterferometry at grain-boundary grooves covered with extremely thin metallic foil. The data were compared with those measured by a silvered replica of grain-boundary grooves. (Knapp-USGS)
W73-03930

THE PLEISTOCENE MORaine STAGES OF WEST-CENTRAL PERU,
Aberdeen Univ. (Scotland). Dept. of Geography.
C. M. Clapperton.
Journal of Glaciology, Vol 11, No 62, p 255-263, 1972. 7 fig, 1 tab, 19 ref.

Descriptors: *Glaciology, *Glacial drift, *Glaciation, *South America, *Pleistocene epoch, Stratigraphy, Paleoclimatology, Dating, Mountains, Topography, Glaciers.
Identifiers: *Andes (Peru), *Peru.

Detailed field mapping in three massifs of the central Andes of Peru indicates that there are four glacial moraine stages. Historical evidence and correlation with Patagonia and South Georgia suggest that the three youngest stages relate to Neoglacial re-advances which culminated before 4000 B.P., between A.D. 1750 and 1800 and during the late nineteenth century. The oldest moraine stage may be of late Wisconsin/Weichselian age. The absence of older moraines suggests that the Peruvian Andes were not high enough earlier in the Pleistocene to support larger glaciers. (Knapp-USGS)
W73-03931

SURVEY OF THE RUSTY GLACIER AREA, YUKON TERRITORY, CANADA, 1967-70,
American Geographical Society, New York. Dept. of Exploration and Field Research.
S. G. Collins.
Journal of Glaciology, Vol 11, No 62, p 235-253, 1972. 13 fig, 23 ref, append. NSF Grants GA-1080, GA-512 and GA-14731.

Descriptors: *Glaciers, *Glaciology, *Movement, Surveys, Data collections, Cryology, *Canada, Flow, Temperature, Rheology, Topography, Surges, Glacial drift.
Identifiers: *Glaciers (Surging), *Rusty Glacier (Canada).

A study of the movement of Rusty Glacier was undertaken and continued through four summers because it is believed to be a surging glacier in the last stages of the inactive phase preceding a surge. The entire glacier is very slow moving, essentially motionless in the lower third and most rapid in an

area well above the firm line. Unusually steep flow-line emergence angles and higher than average longitudinal compression rates in the lower-middle part of the glacier indicate gradual thickening of the ice above the stagnant lower tongue. There is no clear correlation between local variations in flow rates and surface or bottom topography. The glacier is mostly colder than 0 deg C to the bottom, and in the one known area of 0 deg C bottom temperature, flow rates are not greater than elsewhere. Although the glacier is everywhere very thin, maximum flow rates seem clearly related only to variations in ice thickness. The nearby Trapridge Glacier is also a surging glacier and exhibits a strikingly similar flow pattern. (Knapp-USGS)
W73-03932

A MODEL OF A SURGING GLACIER,
Technische Hochschule, Vienna (Austria). Institut fuer Geophysik.
E. Bruckl.
Journal of Glaciology, Vol 11, No 62, p 215-218, 1972. 4 ref.

Descriptors: *Glaciers, *Glaciology, *Rheology, *Movement, Friction, Water balance, Regimen, Cryology, Surges, Glacial drift, Model studies.
Identifiers: *Glaciers (Surging).

As the cause of a glacial surge a sudden improvement of the sliding conditions at the glacier bed is assumed. This improvement has the same effect on the behavior of the glacier as an equivalent variation of the annual balance. A simple glacier model shows, as a consequence of an improvement of the sliding conditions, an additional discharge of ice, which can be separated in two phases. The first phase of strong motion yields transport of ice from the upper to the lower part of the glacier. The ice essentially remains within the previous limits of the glacier. The sequence of motion during this phase corresponds to a surge. The second phase of motion is essentially slower. During this phase the ice accumulated in the lower part of the glacier flows beyond the previous limits, till the whole surface level is lowered. (Knapp-USGS)
W73-03933

THE MORPHOLOGICAL EFFECTS OF SURGES OF THE DONJEC GLACIER, ST ELIAS MOUNTAINS, YUKON TERRITORY, CANADA,
Ottawa Univ. (Ontario). Dept. of Geography.
P. G. Johnson.
Journal of Glaciology, Vol 11, No 62, p 227-234, 1972. 9 fig, 9 ref.

Descriptors: *Geomorphology, *Glaciers, *Movement, Topography, Glacial drift, Land forming, Rheology, Pleistocene epoch, Flow, Stratigraphy, Sedimentation, Surges, *Canada.
Identifiers: *Glaciers (Surging), *Donjek Glacier (Canada).

The present surge of the Donjek Glacier on the northeast side of the St Elias Mountains, first noticed in 1969, is producing a number of morphological effects adjacent to the glacier in the terminus area. Although the effects of the surge are minimized by the lobate form of the glacier terminus, several types of push structure, erosional forms, and certain drainage changes are being produced. These forms are similar to older forms close to, or on, the Neoglacial maximum moraine. The similarities suggest that surges may have occurred throughout most of the Neoglacial period. (Knapp-USGS)
W73-03934

PERIODIC SURGE ORIGIN OF FOLDED MEDIAL MORAINES ON BERING PIEDMONT GLACIER, ALASKA,
Geological Survey, Tacoma, Wash.
A. Post.

WATER CYCLE—Field 02

Snow, Ice, and Frost—Group 2C

Journal of Glaciology, Vol 11, No 62, p 219-226, 1972. 6 fig, 9 ref.

Descriptors: *Glaciers, *Geomorphology, *Glacial drift, *Movement, Stratigraphy, Sedimentation, Topography, Rheology, Land forming, Flow, *Alaska, Surges.

Identifiers: *Glaciers (Surging), *Bering Piedmont Glacier (Ala).

The vast Bering piedmont glacier, which has large folds in the medial moraines in its terminal lobe, recently experienced two surges with a combined ice displacement of as much as 13 km. Vertical aerial photographs taken before and after the surges disclose the direction and magnitude of ice flow in various parts of the piedmont lobe. The ice moved toward the terminus and expanded in a normal, radial pattern with no evidence of unusual shearing that would result in the formation of large folds. Many surging glaciers display repeated lateral displacements in their medial moraines which result from periodic surging of the main glacier past nonsurging tributaries. Moraines of Bering Glacier display small periodic irregularities of this nature. The large 'accordion' folds in the moraines in the piedmont lobe are judged to be due to the combined effects of compressive flow and lateral or transverse expansion of these previously formed irregularities. The initially small pre-existing perturbations in the moraines are simply spread laterally and shortened radially into large folds as the ice spreads out. A very large debris band composed of repeatedly folded medial moraines extends across the center of the Bering Glacier lobe. These remarkable folds are thought to result from the deformation of surge-related irregularities in medial moraines as they pass through the zone of intensive shear near the glacier's margin. (Knapp-USGS)

W73-03935

MOVEMENT OF WATER IN GLACIERS,
California Univ., Los Angeles.
R. L. Shreve.
Journal of Glaciology, Vol 11, No 62, p 205-214, 1972. 8 ref.

Descriptors: *Glaciohydrology, *Glaciers, *Melt water, *Hydrogeology, *Sediment transport, Sedimentation, Glacial drift, Glaciology, Bed load, Streamflow, Discharge (Water), Melting, Open-channel flow, Closed conduit flow, Karst hydrology, Percolation, Hydraulics.

Identifiers: *Easers, *Subglacial streams.

A network of passages along three-grain intersections enables water to percolate through temperate glacier ice. The deformability of the ice allows the passages to expand and contract in response to changes in pressure, and melting of the passage walls causes the larger passages gradually to increase in size at the expense of the smaller ones. Thus, the behavior of the passages is primarily the result of three basic characteristics: (1) the capacity of the system continually adjusts, though not instantly, to fluctuations in the supply of melt water; (2) the direction of movement of the water is determined mainly by the ambient pressure in the ice; and, most important, (3) the network of passages tends in time to become arborecent, with a superglacial part much like an ordinary river system in a karst region, an englacial part of tree-like systems of passages penetrating the ice from bed to surface, and a subglacial part consisting of tunnels in the ice carrying water and sediment along the glacier bed. A sheet-like basal water layer under a glacier would normally be unstable, the stable form being tunnels. Ice-marginal melt-water streams and lakes are common. Easers trend in the general direction of ice flow with a tendency to follow valley floors and to cross divides at their lowest points and are typically discontinuous where they cross ridge crests. (Knapp-USGS)

W73-03936

LAKE ICE SURVEILLANCE VIA AIRBORNE RADAR: SOME EXPERIMENTAL RESULTS,
Michigan Univ., Ann Arbor. Inst. of Science and Technology.
For primary bibliographic entry see Field 07B.
W73-03937

REMOTE SENSING OF THE ARCTIC ICE ENVIRONMENT,
Raytheon Co., Alexandria, Va. Equipment Div.
For primary bibliographic entry see Field 07B.
W73-03938

MICROWAVE EMISSION FROM SNOW—A PROGRESS REPORT,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 07B.
W73-03930

DETERMINATION OF SEA ICE DRIFT USING SIDE-LOOKING AIRBORNE RADAR,
Coast Guard, Washington, D.C. Office of Research and Development.
For primary bibliographic entry see Field 07B.
W73-03951

UTILIZATION OF DEEP WATER HEAT IN RESERVOIRS FOR THE MAINTENANCE OF UNFROZEN WATER AREAS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
V. V. Balanin, B. S. Borodkin, and G. I. Melkonyan.

Available from National Technical Information Services as AD-716 306, \$3.00 in paper copy, \$3.95 in microfiche. Russian Translation by Cold Regions Research and Engineering Laboratories, Hanover, New Hampshire, 1970. 272 p, 149 fig, 45 tab, 121 ref.

Descriptors: *Reservoirs, *Freezing, *Navigation, *Ice jams, Locks, Pumping, Reservoir operation, Water circulation, Temperature, Hydraulics, Flow control, Pipelines, Harbors.

Identifiers: *Deep water heat, Pneumatic installations.

Data, obtained from laboratory and full scale studies of measures for maintaining reservoirs in an unfrozen condition with the use of heat from deep water, are systematically presented. General descriptions of the means for combating ice and the basic systems of various installations are given. Rough calculations of measures used to keep reservoir basins open at negative temperatures are included. Designs for operational pneumatic installations used in the USSR and abroad for moving deep water, as well as their advantages and disadvantages are described. These installations can be used at ship-raising locks, in front of dam gates, and in general along navigational routes. Recommendations are made concerning necessary future study and research, as well as methods for planning the installations. (Knapp-USGS)

W73-04034

NUMERICAL MODELING OF THE GROWTH OF ICE CRYSTALS, GRAUPEL, AND HAIL,
Environmental Prediction Research Facility (Navy), Monterey, Calif.

E. E. Hindman, II, and D. B. Johnson.
Available from NTIS, Springfield, Va 22151 as AD-746 451 - Price \$3.00 printed copy; \$0.95 cents microfiche. Navy Postgraduate School Environmental Prediction Research Facility Technical Paper No 4-72, July 1972. 48 p, 6 fig, 2 tab, 22 ref, 4 append.

Descriptors: *Ice, *Crystal growth, *Computer models, *Numerical analysis, *Analytical techniques, Fog, Graupel, Hail, Diffusion, Tem-

perature, Growth rates, Crystals, Forecasting, Crystallization.

An empirical approximation, made with the use of the Navy Weather Research Facility UNIVAC 1107 Computer, is presented for estimating the growth of ice crystals by diffusion. The approximation is valid for computing crystal growth in conditions of constant temperature and water saturation. Crystal growth in these conditions has been realistically simulated for a period of 30 minutes in the range of temperatures from -1 to -30 C. Modifications to the approximation are presented which permit it to be applied in conditions of varying temperature and varying saturation. The classical approach to the growth of ice crystals by accretion is expanded and coupled with the empirical approach to diffusion growth. This coupling simulates the growth of ice crystals to rimed crystals, rimed crystals to graupel, and graupel to hail. Detailed numerical information for these simulations is presented. (Woodard-USGS)

W73-04104

HYDRAULIC ROUGHNESS OF ICE COVERS,
Lund Inst. of Tech. (Sweden). Div. of Hydraulics. P. Larsen.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9498, p 111-119, January 1973. 4 fig, 1 tab, 9 ref, 1 append.

Descriptors: *Roughness (Hydraulic), *Ice cover, *Rivers, *Ice-water interfaces, *Heat transfer, Cold regions, Ice, Freezing, Melting, Water temperature, Ripple marks.

Rivers and canals covered with ice develop ripple-like reliefs on the ice underside causing head losses considerable in excess of those of smooth boundaries. Ice thickness near the banks is several times that of the conveying part of the waterway. It is postulated that these features are caused by heat transferred from the bottom of the waterway. Observed ratios of wave height to wave length of the ripples do not exceed approximately 0.12. This is the approximate upper limit of wave index number of separation free flow over sinusoidal waviness. Some measured values of ice roughness coefficient (Mannings n) are given. A graph presenting a dimensionless solution for composite roughness coefficient as a function of ice underside and channel bed coefficients is included. (Knapp-USGS)

W73-04218

PERFORMANCE OF A FROST-TUBE FOR DETERMINATION OF SOIL FREEZING AND THAWING DEPTHS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 07B.
W73-04254

GROWTH FORM AND WATER RELATIONS OF MOSSES IN THE MARITIME ANTARCTIC,
Aberdeen Univ. (Scotland). Dept. of Botany. C. H. Gimingham, and R. I. L. Smith.

Br Antarct Surv Bull. 25, p 1-21, 1971, Illus. Identifiers: Andreaea, *Antarctic, Bryum-Algines, Calliergon, Chorisodontium-Aciphyllum, Drepanocladus-Unicinatus, Grimmia, *Growth (Mosses), Maritime, *Mosses, Polytrichum-Alpestre, Polytrichum-Alpinum.

Determinations of normal field water content and the approximate proportion held 'externally' (e.g. between leaves and stem) were made for a number of mosses on Signy Island. The effects of colony form (i.e. packing and arrangement of shoots) on water loss in desiccating atmospheres and on water uptake were determined experimentally. Dense growth forms (cushions, turfs, carpets) are predominant. Species of Andreaea and Grimmia

Field 02—WATER CYCLE

Group 2C—Snow, Ice, and Frost

(small cushions) exhibit the greatest effect of colony form upon evaporation rate and occupy the most exposed habitats. Their ability to take up water rapidly from an intermittent supply in contact with any part of the shoot is also marked. *Polytrichum alpinum*, belonging to similar habitats, exhibits resistance to evaporation from the shoot (perhaps a result of cuticularization) rather than any effect of colony form. This species occurs normally on particulate substrata and water uptake is largely from below. The peat-forming mosses *P. alpestris* and *Chorisodontion aciphyllum* both have a tomentum of rhizoids which facilitates the upward passage of water from the stem base, and the latter species also readily passes water downwards along the shoot from the apex. The water available to the growing regions of these dense turfs may be derived both from the melting surface of the permafrost peat (about 25 cm. depth) and from rain and snow on the surface. The carpet-forming species (e.g. *Calliergon cf. stramineum*) of swamp habitats and the large cushions of drainage channels (e.g. *Bryum algens*) are mosses, whose shoots when isolated lose water rapidly, and whose colony form is somewhat less effective in restricting the rate of loss. Most of these species from habitats having a permanent ground-water supply exhibit rapid uptake and effective ectohydric transport of water. *Drepanocladus uncinatus* ranges in growth form from a compact mat to a robust carpet type and shows a correspondingly wide ecological amplitude in relation to water supply.—Copyright 1972, Biological Abstracts, Inc.

W73-0429

BENEFICIAL USE OF HEAT IN ICELAND, TECHNICAL AND ECONOMICAL ASPECTS AND FUTURE PROSPECTS,
For primary bibliographic entry see Field 05G.
W73-04348

A SAMPLING SCHEME FOR SHALLOW SNOWPACKS,
Guelph Univ. (Ontario). School of Engineering.
For primary bibliographic entry see Field 07B.
W73-04386

ICE ANALYSES. DATA FROM THREE NORWEGIAN LAKES,
Oslo Univ. (Norway). Dept. of Limnology.
O. Grøterud.
Hydrobiologia, Vol 40, No 3, p 371-391, October 30, 1972. 7 fig, 11 tab, 12 ref.

Descriptors: *Water chemistry, *Ice, *Lake ice, Iced lakes, Nutrients, Water quality, Phosphates, Nitrates, Ammonia, Water analysis.
Identifiers: *Norway.

Ice from three lakes in Norway was analyzed. The lake waters and the precipitation in the lake areas were also investigated. One of the lakes is a high mountain lake. The contents of $\text{NO}_3 + \text{NO}_2$ and NH_4 were relatively high in the ice of the three lakes. The PO_4 content was high only in the ice of Ovre Heimdalvatnet (the high mountain lake). Experiments indicated that PO_4 may be released from living and dying cells on freezing. (Knapp-USGS)
W73-04506

USE OF NEW GLACIER INVESTIGATION TECHNIQUES IN ANTARCTICA (PRIMENENIYE NOVYKH METODOV GLYATSIOLOGICHESKIKH ISSLEDOVANIY V ANTARKTIDE),
Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skiy Institut, Leningrad (USSR).
V. G. Aver'yanov.

In: Glyatsiologicheskiye issledovaniya v polarynykh strakh; Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skiy Institut Trudy, No 294, p 94-106, Leningrad, 1970. 38 ref.

Descriptors: *Glaciology, *Glaciation, *Glaciers, *Antarctic, *Analytical techniques, Measurement, Sounding, Sampling, Core drilling, Snow surveys, Seismic studies, Gravity studies, Isotope studies, Dating, Remote sensing, Aircraft, Radar, Instrumentation, Foreign research, Reviews.

Identifiers: USSR, *Ice sheets, *Ice shelves, *Ice thickness, Tellurometers, Geodetic surveying.

count, palynological, and geomorphological data, the age of the marginal glacial formations in northern Estonia ranges between 12,050 and 13,000 years, and the final retreat of glaciers probably occurred in Allerod time about 11,000 years ago. (Josefson-USGS)

W73-04513

PALEOMAGNETIC STUDIES OF BOTTOM SEDIMENTS FROM THE INDIAN OCEAN AREA OF THE ANTARCTIC (PALEOMAGNIT-NNYE ISSLEDOVANIYA DANNYKH OTLOZHENIY INDIYSKOGO SEKTORA ANTARKTIKI),
Severo-Vostochnyi Kompleksnyi Nauchno-Issledovatel'skiy Institut, Magadan (USSR).
For primary bibliographic entry see Field 02J.
W73-04516

NEW DATA ON DIATOMS FROM SEDIMENTS OF THE BOREAL TRANSGRESSION IN THE VAGA RIVER BASIN (NOVYYE DANNYYE O DIATOMOVYKH VODOROSLYAKH OTLOZHENII BOREAL'NOY TRANSGRESII V BASSEYN VAGI),
Akademiya Nauk SSSR, Syktyvkar. Institu Geologii.
For primary bibliographic entry see Field 02J.
W73-04517

APPLICATION OF LASERS TO INVESTIGATION OF GLACIER MOVEMENT (ISSLEDOVANIYE DINAMIKI DVIZHENIYA LEDNIKOV S POMOSHCH'YU LAZERA),
Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skiy Institut, Leningrad (USSR).
I. M. Belousova, V. V. Bogorodskiy, O. B. Danilov, and I. P. Ivanov.
Akademiya Nauk SSSR Doklady, Vol 199, No 5, p 1055-1057, 1971. 3 fig, 4 ref.

Descriptors: *Glaciology, *Glaciers, *Ice, *Analytical techniques, *Instrumentation, Measurement, Movement, Velocity, Surfaces, Bedrock, Equations.
Identifiers: USSR, *Ice sheets, *Glacier flow, *Lasers, *Geodetic studies.

OPPLEL LASER SYSTEMS HAVE PRACTICAL APPLICATIONS IN GLACIER SURFACE-VELOCITY MEASUREMENTS. Provided 10 oscillations are observed, the time required to measure the velocity of a glacier moving at a rate of 1.58 m/year is 50 seconds. Lasers can also be used to investigate nonuniform glacier flow caused by the character of the underlying relief and by different glaciological and temperature conditions. (Josefson-USGS)
W73-04510

MARGINAL GLACIATION IN NORTHERN ESTONIA (KRAYEVYYE LEDNIKOVYYE OBRAZOVANIYA SEVERNOY ESTONII),
Akademiya Nauk Estonetskoi SSR, Tallin.
A. Raukas, E. Rahni, and A. Müidei.
Izdatel'stvo "Valgus", 1971. 252 p.

Descriptors: *Glaciology, *Glaciation, *Glaciers, *Glacial drift, *Glacial sediments, Sedimentation, Geomorphology, Topography, Structural geology, Mineralogy, Palynology, Dating, Age, Geological time, Rocks, Lakes, Ice, Profiles, Cross-sections, Maps.
Identifiers: USSR, Estonian SSR, *Glacio-fluvial sediments, *Glacio-lacustrine sediments, Drumlins, Ekers, Kames, Paleogeography, Tectonics.

Data on formation, structure, and distribution of marginal glacial forms in northern Estonia were based on long-term geological and geomorphological investigations by the Institute of Geology of the Estonian Academy of Sciences in an area covering more than 30,000 sq km. Depositional landforms examined include glacial forms (end moraines, lateral moraines, drumlins); glacio-fluvial features (valley trains, ekers, kame terraces, kames, outwash deltas); glacio-lacustrine features (ice-dammed lakes); and features produced by wastage of stagnant ice (dead-ice moraines). On the basis of radiometric, varve-

Investigations of glacier movement were based on a technique involving measurements of the beat frequency generated by interference of light from a gas laser with light reflected from the glacier surface at two points near the Molodezhnaya Station on the coast of the Sea of Commano in Antarctica between December 10, 1969 and March 8, 1970. Typical oscilloscopes of beats observed on the Heiss glacier indicate independent beats of various frequencies in the 0.3 Hz to 10 Hz range, which correspond to calculated glacier velocities of 0.1 microns/sec and 3.3 microns/sec, respectively. A quantitative measure of glacier movement by laser techniques has practical applications in glaciology. (Josefson-USGS)
W73-04518

2D. Evaporation and Transpiration

EFFECTS OF SOIL TEXTURE ON EVAPORATIVE LOSS AND AVAILABLE WATER IN SEMI-ARID CLIMATES,
Kansas State Univ., Manhattan. Div. of Biology.
H. U. Alizai, and L. C. Hubert.
Soil Science, Vol 110, No 5, p 328-332, November, 1970. 2 fig, 4 tab, 14 ref.

Descriptors: *Evaporation, *Soil-water-plant relationships, *Available water, Soil moisture, Soil science, *Soil texture.
Identifiers: Coarse-textured soil, Fine textured soil.

WATER CYCLE—Field 02

Streamflow and Runoff—Group 2E

Greenhouse experiments were conducted on three soils to test the effect of soil texture on evaporation. Evaporation was 3 times as great from the loam as from gravelly sand after adding equal amounts of water. Sorghum plants remained turgid in gravelly sand but wilted and died in loam supplied with equal amounts of water. This confirms that more water evaporates from fine-textured than from coarse textured soils. (Skogerboe, Colorado State) W73-03952

CONQUEST OF WASTES SHOW PRODUCTIVITY.
For primary bibliographic entry see Field 03F.
W73-03979

INVESTIGATION OF THE POSSIBILITY OF ARTIFICIAL CONTROL OF THE RATE OF EVAPORATION FROM SOILS (IN RUSSIAN),
V. G. Chalenko, M. V. Tovbin, and L. S. Vigulyarnaya.

Tr Ukr Nauchno-Issled Gidrometeorol Inst. 90, p 127-134, 1970.

Identifiers: Artificial control, "Capillary suction, "Evaporation, "Soils, Suction, Water transport.

The rate of evaporation from soils with moisture content approx. 20% is controlled by the rate of capillary suction of water toward the soil surface through the capillaries from wider capillaries and microcavities. After depletion of the microcapillaries, the evaporation front descends through the soil depth, the evaporation rate drops drastically and is limited by the rate of evaporation of water from the menisci of soil capillaries and by diffusion of water vapor into the surrounding space. Pellicular water transport is not significant. The recommended practices for slowing the evaporation are hydro-phobization of the surface soil layer, production of a layer nonporous or coarsely porous particles on the soil surface by processing the superficial soil aggregates with a substance capable of "gluing-up" fine pore openings. This protective layer also diminishes soil salinization.—Copyright 1972, Biological Abstracts, Inc.

W73-04013

EVAPOTRANSPIRATION AND POTENTIAL EVAPOTRANSPIRATION MEASURES IN SAN-TIAGO DE COMPOSTELA (SPAIN),
Instituto de Investigaciones Geológicas, Edafológicas y Agrobiológicas de Galicia, Santiago (Spain). F. Diaz-Fierros, and F. Gutian Ojeda.

An Edafol Agrobiol. Vol 30, No 9/10, p 993-1004, 1971. Illus. English summary.

Identifiers: Climate, "Evapotranspiration, Grass-M, Potential evapotranspiration, "Santiago-de-Compostela, Soils, "Spain, Transpiration, Grass cover.

Grass cover potential evapotranspiration (PET), pan evaporation and climatological data in 1968-70 were measured. The most suitable formula was Turc's. The correlations established between pan evaporation and PET were high and reliable. The relationship between yearly ET and PET was also determined.—Copyright 1972, Biological Abstracts, Inc.

W73-04028

STEADY-STATE EVAPORATION THROUGH NON-HOMOGENEOUS SOILS FROM A SHALLOW WATER TABLE,
Volcani Inst. of Agricultural Research, Rehovot (Israel).

A. Hadas, and D. Hillel. Soil Science, Vol 113, No 2, p 65-73, February 1972. 5 fig, 3 tab, 14 ref.

Descriptors: "Evaporation, "Soil water movement, "Water table, Anisotropy, Stratification, Air-earth interfaces, Mass transfer, Temperature, Vapor pressure, Capillary conductivity.

Identifiers: "Israel soils.

A theoretical and experimental study was carried out to examine the evaporation rate from a shallow water table through a layered soil profile as affected by the sequence and thickness of soil textural and structural layers, their hydraulic properties, and water table depths. Soil layering reduces evaporation, especially when a coarse-textured soil overlies a fine-textured soil, or when a tillage-induced, coarse-structured layer overlies a fine-structured layer. The theoretically predicted evaporation rates were considerably larger than the measured ones. This discrepancy is attributed to an interlayer contact zone. (Knapp-USGS) W73-04110

WAVE EFFECT AND EDDY DIFFUSIVITY IN THE AIR NEAR A WATER SURFACE,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
For primary bibliographic entry see Field 02E.
W73-04209

ISOTHERMAL DRYING OF STRUCTURALLY LAYERED SOIL COLUMNS,
Hebrew Univ., Rehovot (Israel). Faculty of Agriculture.

D. Hillel, and A. Hadas. Soil Sci. Vol 113, No 1, p 30-35. 1972. Illus.

Identifiers: "Soil moisture, Air, Columns, Drying, "Evaporation, Soil layers.

The effects of aggregated top layers of different thicknesses and aggregate sizes on evaporation from initially moist columns of soil in the absence of a water table were studied. There are optimal aggregate size ranges and depths of top-layer which result in maximal reduction of evaporative losses from layered soil columns. The data suggest that in order to solve the water flow equation for drying layered soils, some factors such as the interfacial impedance to water flow and the air permeability of the aggregated top layer and the effect of wind gustiness on vapor convection (which might occur simultaneously with liquid flow) must be considered.—Copyright 1972, Biological Abstracts, Inc.

W73-04256

SOIL MOISTURE PRESSURE AND RELATIVE TRANSPERSION OF PLANTS IN THE CASE OF SOIL DROUGHT (IN RUSSIAN),
Moscow State Univ. (USSR).

I. I. Sudnitsyn, and N. A. Muromtsev. Ekologiya, Vol 2, No 4, p 105-108, 1971. Illus.

Identifiers: "Avena-M, Drought, Leaves, Soil moisture, "Oats-M, Pressure, "Soil drought, "Transpiration, Wilting.

Experiments on oats (*Avena*) showed that a decrease of relative transpiration occurs long before the soil moisture pressure reaches a minimum (critical) value corresponding to persistent wilting of the plants. The decrease of relative transpiration lessens the rate of outflow of water from the plant tissues and thereby allows time for reorganization of physiological processes leading to an increase of drought resistance in the plants, particularly to an increase of the suction force of the leaves.—Copyright 1972, Biological Abstracts, Inc.

W73-04524

INTERCEPTION OF RAIN BY FOREST VEGETATION-ESTIMATION OF DAILY INTERCEPTION USING A MATHEMATICAL MODEL (INTERCEPTION DE LA PLUIE PAR LA VEGETATION FORESTIERE-ESTIMATION DE L'INTERCEPTION JOURNALIÈRE A L'AIDE D'UN MODÈLE MATHEMATIQUE),
Institut Royal Meteorologique de Belgique, Bruxelles.

For primary bibliographic entry see Field 02A.
W73-04530

WATER CYCLE—Field 02

Streamflow and Runoff—Group 2E

FLOOD FORECASTING IN THE UPPER MIDWEST - DATA ASSEMBLY AND PRELIMINARY ANALYSIS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 04A.
W73-03906

STREAMFLOW ROUTING (WITH APPLICATIONS TO NORTH CAROLINA RIVERS),
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 04A.
W73-03908

RHEOLOGY OF FRICTION-REDUCING POLYMER SOLUTIONS,
California State Coll. Los Angeles. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 06B.
W73-03913

GAZETTEER OF NATURAL DRAINAGE AREAS OF STREAMS AND WATER BODIES WITHIN THE STATE OF CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 07C.
W73-03914

ENERGY SPECTRA OF SEA WAVES FROM PHOTOGRAPHIC INTERPRETATION,
Raytheon Co., Wayland, Mass.
For primary bibliographic entry see Field 07B.
W73-03939

SEA SURFACE TEMPERATURE MAPPING OFF THE EASTERN UNITED STATES USING NASA'S ITOS SATELLITE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-03942

SURFACE WATER MOVEMENT STUDIES UTILIZING A TRACER DYE IMAGING SYSTEM,
 Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 07B.
W73-03943

A TECHNIQUE FOR THE COMPARISON OF CONTACT AND NON-CONTACT MEASUREMENTS OF WATER SURFACE TEMPERATURE,
Rensselaer Polytechnic Inst., Troy, N.Y.
For primary bibliographic entry see Field 07B.
W73-03948

FINITE-DIFFERENCE CONVECTION ERRORS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
D. A. Bella, and W. J. Grenney. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 96, No 6A, p 1361-1375, December, 1970, 9 fig, 2 tab, 6 ref.

Descriptors: "Mathematical models, "Water quality, Finite element analysis, Analytical techniques, Numerical analysis, "Dispersion, "Convection.
Identifiers: "Dispersion error calculation.

An investigation was made of the errors associated with several commonly used finite-difference convection approximations. The nature of these errors were classified into three categories characterized

Field 02—WATER CYCLE

Group 2E—Streamflow and Runoff

by: (1) oscillations in the numerically computed distributions, (2) skewness of the numerical distribution, and (3) spreading of the distribution. Errors were most noticeable for computations of slug load convection. Smooth distributions tended to superimpose and mask the errors; thus, a satisfactory computation of a smooth distribution provided a poor test of the accuracy of a numerical model. Numerical methods in which most of the error was classified as a dispersive error were investigated. Means of accurately calculating the dispersion error were developed, and it was shown that the error associated with such methods could be calculated and controlled. (Murphy-Texas)
W73-03997

AMPLIFICATION CRITERION OF GRADUALLY VARIED, SINGLE PEAKED WAVES.
Ottawa Univ., (Ontario). Dept. of Civil Engineering.
For primary bibliographic entry see Field 08B.
W73-04097

INVESTIGATION AND CALCULATION OF COMPONENTS IN THE HYDROLOGIC REGIME OF RIVERS (ISSLEDUVANIYE I RASCHETY ELEMENTOV GIDROLOGICHESKOGO REZHIMA REK).
Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut, Kiev (USSR).

Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut Trudy, No 107, P. F. Vishnevskiy, editor, Moscow, 1971. 167 p.

Descriptors: *Hydrology, *Rivers, *Discharge (Water), *Runoff, *Streamflow, Low flow, Floods, Historic floods, Storms, Hydrographs, Precipitation (Atmospheric), Rainfall-runoff relationships, Surface-groundwater relationships, Melt water, Karst hydrology, Sediments, Mudflows, Orography, Meteorology, Forecasting. Identifiers: *USSR, *Ukraine, *Moldavia, Flood-producing precipitation, Karst topography.

This collection of 13 papers provides information on flood discharge, spring runoff, and minimum flow on rivers in the Ukraine and Moldavia. Investigations are made of the catastrophic flood on the Tisza River in May 1970, storm runoff on small watersheds in lowlands of the Ukraine, and maximum flood discharges on mountain streams in the Crimea. Also examined are effect of karst topography on floods on left-bank tributaries of the Dniester River; effect of underlying geologic formations on annual runoff in lowlands of the Dniester River basin; minimum streamflow in northwest Ukraine; particle size of mudflows on Carpathian rivers in the Ukraine; and status of hydrologic studies in northern Algeria. (See W73-04112 thru W73-04120) (Josefson-USGS)
W73-04111

HISTORIC FLOOD ON THE TISZA RIVER, MAY 12-18, 1970 (VYDAYUSHCHIYSYA DOZHDEVY PAVODOK NA R. TISE 12-18 MAYA 1970 G.).
Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut, Kiev (USSR). P. F. Vishnevskiy, and V. I. Kulinchik. In: Issledovaniya i raschety elementov gidrologicheskogo rezhima rek; Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut Trudy, No 107, p 3-14, Moscow, 1971. 7 fig, 5 tab, 1 ref.

Descriptors: *Floods, *Historic floods, *Flood data, Flood waves, Flood stages, Flood peak, Flood damage, Overflow, Water levels, Dams, Meteorology, Precipitation (Atmospheric), Rainfall, Rainfall intensity, Storms, Isohyets. Identifiers: *USSR, *Ukraine, *Tisza River.

The precipitation which occurred over a large part of the Ukraine in May 1970 was considerably greater than the long-term average. Rainfall in the Carpathians and Transcarpathian region was especially high. In most regions of the L'vov, Ivanofrankivsk, Chernovtsi, and Zakarpatskaya Oblasts, measured precipitation was 150-200 mm, or 2-3 times the average monthly rainfall for May. Heavy rains on May 12-13 resulted in a catastrophic flood on the Tisza River, with water levels reaching unprecedented heights. The depth of rain at the Khust gaging station on May 13 was 131 mm and that at the Delovoye station on the same day was 99 mm. The rate of flood rise was 93 cm/hr. Travetime of the flood wave in the mountainous part of the river channel was 4.1-4.7 m/sec and that in lowlands of the Vylok-Chop reach was 0.52 m/sec. Flood damage in the Tisza River valley included inundation of population centers, destruction of homes, highways, and bridges, and interruption of communications. (See also W73-04111) (Josefson-USGS)
W73-04112

INVESTIGATION OF STORM RUNOFF ON SMALL WATERSHEDS IN LOWLANDS OF THE UKRAINE (ISSLEDUVANIYE POTER' DOZHDEVOGO STOKA NA MALYKH VODOBORAKH RAVNINNOY TERRITORII UKRAINY).
Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut, Kiev (USSR). N. G. Galushchenko.

In: Issledovaniya i raschety elementov gidrologicheskogo rezhima rek; Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut Trudy, No 107, p 23-37, Moscow, 1971. 4 fig, 4 tab, 16 ref.

Descriptors: *Storm runoff, *Rainfall-runoff relationships, *Rainfall disposition, *Rainfall intensity, *Small watersheds, Slopes, Forests, Grasslands, Soils, Floods, Discharge (Water), Depth-area-duration analysis, Distribution patterns.

Identifiers: *USSR, *Ukraine, Flood-producing precipitation, Rainfall depth, Pluviographs.

Investigations of storm runoff on slopes and small watersheds in forest, forest-steppe, and steppe zones of the Ukraine were based on long-term observation data of the Desna and Veliko-Anadol' precipitation-streamflow stations and Boguslav field experiment station. Graphs are constructed to show relation of total storm runoff to depth and intensity of flood-producing precipitation in basins ranging in size from 0.014 sq km to 39 sq km. Storm-runoff rates are dependent upon distribution, depth, and intensity of precipitation. (See also W73-04111) (Josefson-USGS)
W73-04113

EFFECT OF KARST ON FLOODS ON LEFT-BANK TRIBUTARIES OF THE DNIESTER RIVER (VLIYANIYE KARSTA NA FORMIROVANIYE LIVNEVYKH PAVODOK NA LEBOVEREZHNYYKH PRITOKA DNESTRA).
Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut, Kiev (USSR). N. I. Drozd, and N. V. Tsupko.

In: Issledovaniya i raschety elementov gidrologicheskogo rezhima rek; Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut Trudy, No 107, p 38-50, Moscow, 1971. 1 tab, 4 ref.

Descriptors: *Karst, *Karst hydrology, *Storm runoff, *Discharge (Water), *Flood discharge, Peak discharge, Rainfall-runoff relationships, Rainfall intensity, Rainfall disposition, Rocks, Carbonate rocks, Limestones, Aquifers, Groundwater, Subsurface drainage, Surface-groundwater relationships, Tributaries.

Identifiers: *USSR, *Ukraine, *Dniester River, *Karst topography, Flood-producing precipitation, Flood duration.

The effect of karst topography on storm runoff was investigated on left-bank streams of the Dniester River in the Ukraine in 1951-65. Karst features of carbonate and sulfate rocks comprising the Volyn-Podolian plateau are reflected in surface forms of the relief and in discharges of summer floods. In West and Central Podolia, regulation of storm runoff by karst results in lower maximum peak discharges and in longer flood periods. Ordinarily, flood discharges are 2-5 times greater than average annual discharges, but during higher floods they are 20-40 times greater. In East Podolia, flood discharges are 20-50 times greater than average annual discharges and during higher floods they are 100 or more times greater. The effect of karst on storm runoff must be considered in connection with protection of surface waters and groundwaters from depletion and contamination. (See also W73-04111) (Josefson-USGS)
W73-04114

CALCULATIONS OF MAXIMUM FLOOD DISCHARGES ON MOUNTAIN STREAMS IN THE CRIMEA (RASCHETY MAKSIMAL'NYKH RASKHODOV VODY DOZHDEVYKH PAVODKOV NA GORNYYKH REKAHK KRYMA).
Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut, Kiev (USSR). Ye. V. Khlybova.

In: Issledovaniya i raschety elementov gidrologicheskogo rezhima rek; Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut Trudy, No 107, p 51-60, Moscow, 1971. 3 fig, 3 tab, 10 ref.

Descriptors: *Discharge (Water), *Flood discharge, *Floods, *Storms, *Streams, Streamflow, Watersheds (Basins), Drainage area, Orography, Statistical methods, Probability, Seasonal. Identifiers: *USSR, *Ukraine, *Crimea.

Data are presented on hydrometric observations of maximum mountain streamflow in the Crimea. A statistical analysis is made of maximum water discharges, and long-term characteristics are defined for maximum floods during warm (May-November) and cold (December-April) seasons of the year. An equation is developed to compute maximum discharges on ungaged mountain streams. Coefficients for converting maximum discharges of 1% probability to discharges of other probabilities are tabulated. (See also W73-04111) (Josefson-USGS)
W73-04115

SPRING-FLOOD RUNOFF FROM SMALL WATERCOURSES IN THE UKRAINE AND MOLDAVIA (OB'YEMY STOKA VESENNEGO POLOVOD'YA MALYKH VODOTOKOV UKRAINY I MOLDAVII).
Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut, Kiev (USSR). L. G. Onufriyenko.

In: Issledovaniya i raschety elementov gidrologicheskogo rezhima rek; Ukrainskii Nauchno-Issledovatel'skiy Gidrometeorologicheskii Institut Trudy, No 107, p 61-91, Moscow, 1971. 4 fig, 1 tab, 5 ref.

Descriptors: *Discharge (Water), *Flood discharge, *Runoff, *Spring, *Streams, Watersheds (Basins), Drainage area, Alpine, Elevation, Slopes, Gaging stations, Runoff coefficient, Maps, Equations. Identifiers: *USSR, *Ukraine, *Moldavia, *Crimea.

Development of techniques to compute spring-flood discharges on small watercourses in the Ukraine and Moldavia was based on runoff of 446 gaging stations with drainage areas ranging from 0.1 to 2,450 sq km. A relation is established between spring runoff of ungaged streams in mountain regions of Crimea and average basin slope and elevation. (See also W73-04111) (Josefson-USGS)
W73-04116

WATER CYCLE—Field 02

Streamflow and Runoff—Group 2E

EFFECT OF UNDERLYING FORMATIONS ON ANNUAL RUNOFF IN LOWLANDS OF THE DNIESTER RIVER BASIN (VLIYANIYE NA GODOVYI STOK OSOBNOSTEI PODSTILAYUSHCHEV POVERKHNOSTIV RAVNINOY CHASTI BASSEYNA DNESTRA),
Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
N. I. Kononenko.

In: Issledovaniya i raschety elementov gidrologicheskogo rezhima rek; Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut Trudy, No 107, p 114-120, Moscow, 1971. 3 fig, 3 tab, 3 ref.

Descriptors: *Runoff, *Runoff coefficient, *Rain-fall-runoff relationships, *Geologic formations, *Rocks, Rivers, River basins, Storms, Floods, Water balance, Water storage, Evaporation, Topography, Karst, Surface-groundwater relationships, Annual, Seasonal.
Identifiers: *USSR, *Ukraine, *Dniester River, Flood-producing precipitation, Flood duration.

The effect of fissured and karstic sulfate and carbonate rocks on annual runoff, spring-runoff, and summer floods in lowlands of the Dniester River basin was investigated. Analysis of changes in spring-runoff coefficients computed for 1956, 1959-61, and 1963 and in flood-discharge coefficients for individual periods between 1948 and 1959 reveals an increase in runoff volume in basins with limited karst development. Complexity of surface-groundwater relationships in present karst studies precludes quantitative assessment of the effect of underlying geologic formations on annual runoff as defined by graphs of precipitation-runoff relations. (See also W73-04111) (Josefson-USGS)
W73-04117

MINIMUM STREAMFLOW IN NORTHWEST UKRAINE (OSOBNOSTI FORMIROVANIYA MINIMAL'NOGO STOKA REK SEVERO-ZAPADA UKRAINY),
Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
I. I. Voloshin.

In: Issledovaniya i raschety elementov hidrologicheskogo rezhima rek; Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut Trudy, No 107, p 121-132, Moscow, 1971. 3 fig, 5 tab, 4 ref.

Descriptors: *Streamflow, *Low flow, *Discharge (Water), Hydrogeology, Surface-groundwater relationships, Groundwater recharge, Aquifers, Rocks, Karst, Rivers, River basins, Watersheds (Basins), Drainage area, Gaging stations, Surveys, Monthly, Annual, Seasonal.
Identifiers: *USSR, *Ukraine.

Investigations of minimum flow in northwest Ukraine were based on observations at 75 gaging stations on 43 rivers in the Western Bug, Pripyat', Teteriv, and Irpen' River basins. Watershed size varies between 34.4 and 27,000 sq km. Minimum flow is determined mainly by groundwater storage, basin area, and local hydrogeological conditions. Within the Ukrainian crystalline shield on the east, minimum summer flow varies between 0.2 and 0.6 liter/sec/sq km, and minimum winter flow between 0.5 and 1.5 liter/sec/sq km. In the region of carbonate rocks on the west, minimum flow (0.1-0.3 liter/sec/sq km in summer and 0.6-1.5 liter/sec/sq km in winter) occurs on rivers in the Volynian woodlands, while maximum discharges (1-2 liter/sec/sq km in summer and 3-4 liter/sec/sq km in winter) are observed in upper reaches of rivers in the Podolian Upland. A relation is established between minimum flows and basin areas for rivers in the east and between minimum and annual flows for rivers in the west. Scatter of individual points in the relations is typical of watersheds with marked karst development. Based on hydrometric surveys in 1968-70, streamflow losses were observed on a number of tributaries in the Western Bug and Pripyat' River basins. (See also W73-04111) (Josefson-USGS)

W73-04118

PARTICLE SIZE OF MUDFLOWS ON CARPATHIAN RIVERS IN THE UKRAINE (GRANULOMETRICHESKIY SOSTAV SELEVYKH OTLOZHENIY NA REKAH UKRAINSKIH KARPAT),
Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
M. M. Ayzenberg, and M. L. Vol'tsun.

In: Issledovaniya i raschety elementov hidrologicheskogo rezhima rek; Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut Trudy, No 107, p 133-138, Moscow, 1971. 1 fig, 3 tab, 9 ref.

Descriptors: *Erosion, *Mudflows, *Particle size, *Sediments, Alluvial fans, Clays, Sands, Silts, Gravels, Boulders, Analytical techniques, Sieve analysis.

Identifiers: *USSR, *Ukraine, *Carpathian Mountains, Pebbles, Cobbles.

Methods are presented for determining particle size of mudflows on Carpathian rivers in the Tisza, Prut, and Dniester River basins in western Ukraine. Sediments in the Tisza River basin are predominantly small particles <100 mm in diameter with 5%-40% of the sediments classified as pebbles. The percentage of large pebbles in the Prut River basin is 7-48, and the percentage of medium and small pebbles is 5-41. Sediments in the Dniester River basin are predominantly large pebbles (8%-44%). Grain-size distribution is tabulated for each mudflow basin on the basis of the physical character of the erosional agent. (See also W73-04111) (Josefson-USGS)
W73-04119

HYDROLOGIC STUDIES IN NORTHERN ALGERIA (O GIDROLOGICHESKOVYI ZUCHENOSTI TERRITORII SEVERNOGO ALZHIRA),
Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
N. N. Padun.

In: Issledovaniya i raschety elementov hidrologicheskogo rezhima rek; Ukrainiskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut Trudy, No 107, p 139-150, Moscow, 1971. 2 fig, 1 tab, 14 ref.

Descriptors: *Investigations, *History, *Hydrology, *Hydrologic data, Hydrography, Orography, Climatology, Meteorology, Watersheds (Basins), Drainage area, Gaging stations, Flow measurement, Streamflow, Water distribution (Applied), Construction, Design.
Identifiers: *Algeria.

A review of the history of hydrologic studies in northern Algeria, covering an area of 205,000 sq km, is based on data collected by the author in 1965-68 and on a meager number of sources in the literature. Average annual precipitation varies between 300-400 mm in the west to 1,000-1,200 mm in central and eastern portions. Inland precipitation decreases to 400-500 mm in the east and to 200 mm or less in the west and south. Over 93% of the gaging stations are located in basins of rivers flowing into the Mediterranean Sea. Density of precipitation stations for northern Algeria averages 1 per 2,260 sq km and in the region of the Mediterranean Sea 1 per 1,530 sq km. Extensive hydrologic data are available for watercourses with drainage areas of 101-500 and 1,001-5,000 sq km, representing 23% and 32%, respectively, of all gaging stations. The period of record for about 90% of all gaging stations is not more than 20 years, and the length of record for 46% of the stations is less than 5 years. A classification is given of gaging stations according to type of design, and an evaluation is made of the accuracy of data obtained. (See also W73-04111) (Josefson-USGS)
W73-04120

A NEW TOPOLOGICAL RELATIONSHIP AS AN INDICATOR OF DRAINAGE NETWORK EVOLUTION,
Environment Consultants, Inc, Dallas, Tex.
For primary bibliographic entry see Field 04A.
W73-04203

HURST PHENOMENON IN TURBULENCE,
Geological Survey, Fort Collins, Colo.
C. F. Nordin, R. S. McQuivey, and J. M. Mejia.
Water Resources Research, Vol 8, No 6, p 1480-1486, December 1972. 7 fig, 1 tab, 23 ref.

Descriptors: *Turbulence, *Statistics, *Turbulent flow, Probability, Stochastic processes, Mathematical studies, Dispersion, Vortices.
Identifiers: *Gaussian noise, *Hurst phenomenon.

Records of turbulent velocity fluctuations from both laboratory flumes and rivers exhibit the Hurst phenomenon. The Hurst phenomenon suggests long-term persistence in a time series. The implications in turbulent flows are that the integral time scales do not exist and, rather, that the turbulent velocity fluctuations have the properties of fractional Gaussian noise. Some indirect evidence from dispersion studies supports these implications. (Knapp-USGS)
W73-04206

TRANSIENT ANALYSIS OF THE DETROIT RIVER BY THE IMPLICIT METHOD,
National Ocean Survey, Detroit, Mich. Lake Survey Center.
F. H. Quinn, and E. B. Wylie.
Water Resources Research, Vol 8, No 6, p 1461-1469, December 1972. 7 fig, 11 ref.

Descriptors: *Streamflow forecasting, *Great Lakes, *Stage-discharge relations, Hydrograph analysis, Lake Erie, Routing, Numerical analysis, Mathematical studies, Unsteady flow.
Identifiers: *Detroit River.

A hydraulic transient model of the Detroit River was developed by using the implicit method to solve the complete equations of continuity and motion. The river is modeled in the shape of a Y and has one main channel and two branching channels. The stability of the numerical solution, which uses the Newton-Raphson algorithm, is dependent on the selection of a weighting coefficient. This coefficient determines the position at which the equations are evaluated on the X-t grid. The model inputs consist of water surface hydrographs at the head and mouth of the river. The outputs consist of flows at each end of the three channels and water surface elevations at the junction of the Y. Transient flows of the Detroit River induced by a severe wind tide on Lake Erie were simulated to illustrate the model. Good agreement was obtained between measured and computed water surface elevations at the junction of the Y. (Knapp-USGS)
W73-04207

WIND-INDUCED AND THERMALLY INDUCED CURRENTS IN THE GREAT LAKES,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
For primary bibliographic entry see Field 02H.
W73-04208

WAVE EFFECT AND EDDY DIFFUSIVITY IN THE AIR NEAR A WATER SURFACE,
Cornell Univ., Ithaca, N.Y. School of Civil and Environmental Engineering.
I-Ming Cheng, and W. Brutsaert.
Water Resources Research, Vol 8, No 6, p 1439-1443, December 1972. 1 fig, 20 ref.

Descriptors: *Waves (Water), *Diffusivity, *Evaporation, *Turbulence, *Mass transfer, Turbulent flow, Winds, Air-water interfaces, Boundary layers, Shear stress, Drag, Momentum transfer.

Field 02—WATER CYCLE

Group 2E—Streamflow and Runoff

The dynamic characteristics and the development of the underlying water waves were taken into consideration in the determination of the eddy diffusivity in the air close to a water surface. A relationship was estimated between the actual eddy diffusivity and the apparent eddy diffusivity, using only the wind velocity profile. The derivation was in terms of the phase velocity of the dominant wave and the friction velocity, on the basis of experimental data. The eddy diffusivity near the air-water interface, determined in the usual way from the mean velocity profile, may lead to considerable error, depending on the sea state. The practical application of this result is illustrated in the determination of evaporation from a wavy surface. (Knapp-USGS) W73-04209

ON THE TIME WHEN THE EXTREME FLOOD OCCURS,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
P. Todorovic, and D. A. Woolhiser.
Water Resources Research, Vol 8, No 6, p 1433-1438, December 1972. 4 fig, 6 ref.

Descriptors: *Flood frequency, *Flood recurrence interval, *Probability, *Stochastic processes, Statistics, Statistical methods, Flood forecasting, Peak discharge.

The time of occurrence $T(t)$ of the largest momentary flood exceedance in some time interval is a stochastic process. The one-dimensional distribution function and the mathematical expectation of $T(t)$ are determined for the case in which individual flood exceedances are independent, identically distributed random variables and the counting process for exceedances is a non-homogeneous Poissonian process. Rather good agreement between observed and theoretical distributions for two rivers indicates that these assumptions are not extremely restrictive. (Knapp-USGS) W73-04210

RELATIVE DIFFUSION IN NONISOTROPIC TURBULENCE,
Technical Univ. of Denmark, Copenhagen. Sanitary Engineering Lab.
For primary bibliographic entry see Field 05B.
W73-04212

SHAPE EFFECTS ON RESISTANCE IN FLOOD-PLAIN CHANNELS,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
For primary bibliographic entry see Field 06B.
W73-04213

LONGITUDINAL DISPERSION IN SINUOUS CHANNELS,
James Cook Univ. of North Queensland, Townsville (Australia). Dept. of Engineering.
For primary bibliographic entry see Field 05B.
W73-04214

UNIT-RESPONSE METHOD OF OPEN-CHANNEL FLOW ROUTING,
Geological Survey, Oklahoma City, Okla.
For primary bibliographic entry see Field 06B.
W73-04215

ESTIMATING DISCHARGE FROM SURFACE ELEVATION IN BENDS,
State Univ. of New York, Buffalo.
For primary bibliographic entry see Field 06B.
W73-04219

EXACT NONLINEAR MODEL OF WAVE GENERATOR,
Army Coastal Engineering Research Center, Washington D.C.
R. H. Muller.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9467, p 31-46, January 1973. 4 fig, 5 ref, append.

Descriptors: *Waves (Water), *Hydraulic models, Numerical analysis, Mathematical models, Gravity waves, Model studies.

Identifiers: Wave generators.

A numerical method for solving nonlinear hydrodynamic problems of the initial value type was developed and applied in the determination of the wave motion induced by a mechanical wave generator. The existence of a velocity potential, which satisfies the Laplace equation, was assumed. The corresponding kinetic and kinematic boundary conditions were not further simplified. A transformation of the free-surface conditions facilitates a direct numerical integration of the nonlinear free-surface equations. The numerical approximation of the nonlinear solution and the observed response of a vertical bulkhead type generator which oscillates horizontally were compared. The numerical results are in good agreement with the observations. The corresponding linearized problem was also solved and compared to the nonlinear approximation and observed response. (Knapp-USGS) W73-04372

UNIFIED NONDIMENSIONAL FORMULATION FOR OPEN CHANNEL FLOW,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.

For primary bibliographic entry see Field 08B.
W73-04223

PREDICTING EFFECTS OF DEAD ZONES ON STREAM MIXING,
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 05B.
W73-04288

USE OF SURFACE OBSERVATIONS IN BOUNDARY-LAYER ANALYSIS,
National Weather Service, Silver Spring, Md.
For primary bibliographic entry see Field 07C.
W73-04333

PROPERTIES OF THE KERNELS FOR TIME INVARIANT, INITIALLY RELAXED, SECOND ORDER, SURFACE RUNOFF SYSTEMS
For primary bibliographic entry see Field 02A.
W73-04371

A COMPARISON OF MORPHOMETRIC MEASURES OF BANKFULL,
Sydney Univ. (Australia). Dept. of Geography.
S. J. Riisy.

Journal of Hydrology, Vol 17, No 1-2, p 23-31, October 1972. 1 fig, 2 tab, 10 ref.

Descriptors: *Floods, *Stage-discharge relations, *Water measurement, *Channel morphology, Flood plains, Flood profiles, Flood stages, Overflow, Banks.
Identifiers: *Bank index (Flood stage).

Morphometric bankfull may best be defined by the first maximum of the bank index. Other criteria for selecting morphometric bankfull are biased either by selective judgement or by channel characteristics. Three measures frequently employed to define bankfull at cross sectional sites, namely, vegetation limits, minimum width-depth ratio, and aerial photograph inspection, are com-

pared with each other and with a proposed definitive index. The bank index defines the relative slope of a segment of channel profile; high values designate relatively horizontal channel segments and low values define relatively vertical channel profile segments. The accuracy of the bank index depends on the spacing of coordinate points defining the profile. The bank index, plotted against depth for decreasing values of depth within a channel, shows a marked peaked value near the actual bankfull stage. When the floodplain is relatively horizontal the bank index defines a bankfull stage which is similar to bankfull defined from the plotted traverse. If the floodplain level is irregular and poorly defined, or if natural levees are present, then the first maximum of the bank index defines more accurately the floodplain-channel junction. (Knapp-USGS) W73-04375

SOME GENERALIZED CHARACTERISTICS OF THE FLOODS AND DROUGHTS OF THE LOWER MEKONG,
Cornell Univ., Ithaca, N.Y.

C. J. Ewart, and W. Brutsaert.
International Association of Hydrological Sciences Bulletin, Vol 17, No 3, p 323-338, October 1972. 10 fig, 7 tab, 10 ref.

Descriptors: *Flood frequency, *Floods, *Droughts, *Asia, Data collections, Hydrographs, Recession curves, Low flow, Peak discharge, Climates, Water yield, Runoff, Discharge (Water), Streamflow, Rainfall-runoff relationships, Statistics.
Identifiers: *Mekong River, *Southeast Asia.

The hydrological data available for the Lower Mekong River are presented in directly usable form for design purposes by means of a regional frequency study of the annual maximum daily mean flows (floods) and by means of the annual mean minimum flows for various durations (droughts). In addition, a regional analysis is given of the annual dry season recession hydrograph. The only information required to apply these results is the size of the drainage area or the distance along the river upstream from Phnom-Penh. (Knapp-USGS) W73-04380

USING CANONICAL CORRELATION FOR HYDROLOGICAL PREDICTIONS,
Forest Service (USDA), Glendora, Calif. Pacific Southwest Forest and Range Experiment Station.
R. M. Rice.

International Association of Hydrological Sciences Bulletin, Vol 17, No 3, p 315-321, October 1972. 2 fig, 1 tab, 7 ref, 2 append.

Descriptors: *Correlation analysis, *Flood forecasting, *Runoff forecasting, *Data processing, *Variability, Probability, Distribution patterns, Hydrograph analysis.
Identifiers: *Canonical correlation analysis.

Hydrologists often encounter analyses involving multiple dependent variables. Canonical correlation is suggested as a suitable multivariate analog to multiple regression in such situations. However, in order to use canonical correlation for prediction, all roots must be retained. This study of the use of canonical correlation for prediction purposes led to the discovery that, when all roots are retained, a canonical correlation solution is mathematically equivalent to a set of multiple regression solutions. Consequently, multiple regressions are preferable because they give the hydrologist more latitude in the choice of variables in his prediction equations. Results suggest that the D squared statistic is not a suitable descriptor of the differences between hydrographs described by the parameters of a fitted gamma distribution. (Knapp-USGS) W73-04381

WATER CYCLE—Field 02
Groundwater—Group 2F

**WATER RESOURCES OF UNION PARISH,
LOUISIANA,**
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 04B.
W73-04503

**WATER RESOURCES OF OUACHITA PARISH,
LOUISIANA,**
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 04B.
W73-04504

**ROUGHNESS IN A MODEL OF OVERLAND
FLOW,**
Colorado State Univ., Fort Collins. Dept. of Civil
Engineering.
For primary bibliographic entry see Field 06B.
W73-04508

**RELATIONSHIP BETWEEN CIRCULATION
AND STRUCTURE OF WATERS OF THE INDIA-
N OCEAN (O VZAIMOSVYAZI TSIRKULYAT-
SII I STRUKTURY VOD INDIYSKOGO OKE-
ANA),**
Akademiya Nauk SSSR, Moscow. Institut Oke-
anologii.

A. D. Shcherbinin.
Akademiya Nauk SSSR Doklady, Vol 199, No 6, p
1413-1416, 1971. 2 fig, 5 ref.

Descriptors: *Oceanography, *Indian Ocean, *Ocean circulation, *Ocean currents, *Water structure, Water properties, Depth, Sea water, Stratification, Boundary layers, Meteorology, Maps.

Identifiers: *USSR, Thermohaline circulation, Geostrophic currents, Hydrosphere.

Stratification characteristics of waters of the Indian Ocean were investigated in terms of their relation to the vertical structure of currents. Four structural zones of stratification were distinguished: surface, intermediate, deep, and bottom. A relation is established between circulation and thermohaline structure of the waters of the ocean on a macroscale and a mesoscale. The direction of transport of surface, intermediate, and deep waters is plotted on maps showing the dynamic topography of the ocean for depths ranging from 0 m to 3,000 m. (Josephson-USGS)
W73-04515

**PRINCIPLE OF MAXIMUM ENTROPY IN
HYDROLOGIC FREQUENCY ANALYSIS,**
Lagos Univ. (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-04531

**FLOOD OF SEPTEMBER 20-23, 1969, IN THE
GADSDEN COUNTY AREA, FLORIDA,**
Geological Survey, Tallahassee, Fla.
W. C. Bridges, and D. R. Davis.
Florida Bureau of Geology Information Circular
No 79, 1972. 37 p, 23 fig, 3 tab, 6 ref.

Descriptors: *Flood data, *Flood profiles, *Peak discharge, *Streamflow, *Florida, Flood damage, Flood discharge, Stream gages, Gaging stations, Flood recurrence interval, Flood frequency, Storms, Rainfall-runoff relationships, Regional flood, Historic floods, Hydrologic data, Erosion, Bridge failure.
Identifiers: *Gadsden County (Fla.).

The center of low pressure of a tropical disturbance which moved northward in the Gulf of Mexico reached land between Panama City and Port St. Joe, Florida, on September 20, 1969. This system was nearly stationary for 48 hours producing heavy rainfall in the Quincy-Havana area, 70-80 miles northeast of the center. Rainfall exceeded 20 inches over a part of Gadsden County, Florida, during September 20-23, and the maximum rainfall

of record occurred at Quincy with 10.87 inches during a 6-hour period on September 21. The 48-hour maximum of 17.71 inches exceeded the 1 in 100-year probability of 16 inches for a 7-day period. A peak discharge of 45,600 cfs on September 22 at the gaging station on the Little River near Quincy exceeded the previous peak of 25,400 cfs, and the peak discharge of 89,400 cfs at Ochlockonee River near Bloxham exceeded the previous peak of 50,200 cfs. Many flood-measurement sites had peak discharges in excess of that of a 50-year flood. (Woodard-USGS)
W73-04535

**SIMPLE WAVES ON SHEAR FLOWS:
SIMILARITY SOLUTIONS,**
Newcastle-upon-Tyne Univ. (England). School of
Mathematics.
N. C. Freeman.
Journal of Fluid Mechanics, Vol 56, Part 2, p 257-
263, November 28, 1972. 2 fig, 2 ref.

Descriptors: *Waves (Water), *Steady flow, *Currents (Water), Equations, Gravity waves, Wave pile-up, Surges, Unsteady flow, Shear drag, Subcritical flow.
Identifiers: Shear flow.

A class of similarity solutions is derived for the equations of simple waves on inviscid shear flows. Such solutions all have propagation speeds proportional to the square root of the depth and contain the uniform flow solution as a special case. (Knapp-USGS)
W73-04539

**THE INTERACTION OF LARGE AMPLITUDE
SHALLOW-WATER WAVES WITH AN AM-
BIENT SHEAR FLOW: NON-CRITICAL
FLOWS,**

Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
P. A. Blythe, Y. Kazakia, and E. Varley.
Journal of Fluid Mechanics, Vol 56, Part 2, p 241-
255, November 28, 1972. 3 fig, 4 ref. DOD Contract DAAD-5-69-C-0053 NSF Grant GP-34-740.

Descriptors: *Waves (Water), *Steady flow, *Currents (Water), Equations, Gravity waves, Wave pile-up, Surges, Unsteady flow, Shear drag, Subcritical flow.
Identifiers: Shear flow.

The behavior of large amplitude, long gravity waves is described as they move over a horizontal bed into a region where the flow is steady but sheared in a vertical direction. A new class of exact solutions to the nonlinear hydraulic flow equations describes progressing waves; they are sufficiently general to allow both the shape of the free surface at any instant and the shear profile of the undisturbed flow to be specified. The waves are examples of neutrally stable disturbances in the sense that they neither grow nor decay in amplitude, although, like simple waves on an unsheared flow, they can break. (Knapp-USGS)
W73-04540

2F. Groundwater

**SUMMARY OF PANEL ON CARBON
ISOTOPES IN SUBSURFACE HYDROLOGY
AND THE ROLE OF PALEOCLIMATES IN
THEIR INTERPRETATION.**

Journal of Hydrology, Vol 11, No 4, p 439-441, April, 1970.

Descriptors: *Hydrology, *Subsurface waters, *Paleoclimatology, Carbon radioisotopes, Groundwater, *Groundwater movement, *Radioactive dating.
Identifiers: *Groundwater mapping.

A Panel on 'Carbon Isotopes in Subsurface Hydrology and the Role of Paleoclimates in their Interpretation' was held from the 16th to the 20th of March 1970 in Vienna, Austria. Under certain conditions and considered in conjunction with geochemical, stable isotope and related paleoclimatic information, radiocarbon data from water samples are very useful in hydrologic interpretations. They may, for example help distinguish water of different origins. Furthermore, determining an approximate apparent 'age' by the carbon-14 method makes it possible to find the rate of groundwater flow between wells along flow lines (or between a definite recharge zone and sampling points some distance down gradient). (Skogerboe-Colorado State)
W73-03957

**NON-LINEAR THERMODYNAMICS OF SOIL-
WATER-HEAT SYSTEMS,**
Haryana Agricultural Univ., Hissar (India). Dept. of Physics.
For primary bibliographic entry see Field 02G.
W73-03960

**THERMODYNAMICS OF SOIL-WATER
SYSTEM,**
Haryana Agricultural Univ., Hissar (India). Dept. of Physics.
For primary bibliographic entry see Field 02G.
W73-03961

**RAPID MEASUREMENT OF HYDRAULIC
CONDUCTIVITY CHANGES IN SLOWLY
PERMEABLE SOILS,**
Agricultural Research Service, Fresno, Calif.
For primary bibliographic entry see Field 02G.
W73-03968

**SENSITIVITY OF GROUNDWATER FLOW
MODELS TO VERTICAL VARIABILITY OF
AQUIFER CONSTANTS,**
Oklahoma Water Resources Research Inst., Stillwater.
R. N. DeVries, and D. C. Kent.
Available from the National Technical Information Service as PB-214 205, \$3.00 in paper copy, \$0.95 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report December 1972, 56 p, 14 fig, 13 tab, 24 ref. append. OWRR A-038-OKLA (1).

Descriptors: Groundwater, *Hydrogeology, *Base flow, *Model studies, Water management (Applied), Aquifer management, *Aquifer characteristics, Permeability, Specific yield.
Identifiers: *Ogallala aquifer, Transmissibility.

The Ogallala aquifer in the Oklahoma Panhandle is in need of better management because of increased groundwater demand which has caused declines in static water levels at an alarming rate. A groundwater management computer model developed for the Ogallala aquifer in the Texas Panhandle treats the aquifer as a homogeneous system. In this study, the computer model has been modified in order to evaluate the effect of vertical layering on semi-static water level changes which occur during the dewatering of a single unconfined aquifer. The modified model was applied to a study area near Guymon, Oklahoma using both the homogeneous and the multi-layered cases. The aquifer is characterized by a saturated thickness of 400 feet. The accumulated drawdown values of the homogeneous and the multi-layered cases demonstrate that there is about 88 feet difference between the two cases before the base of the aquifer is encountered. Approximately 26 percent more time is required to dewater the layered aquifer. Thus, vertical variations of lithology in an aquifer such as the Ogallala should be considered when prediction is made relative to groundwater management. A physical sand model was constructed using four layers of Ogallala aquifer

Field 02—WATER CYCLE

Group 2F—Groundwater

material. Pumping tests and drainage tests were conducted. Average values of aquifer characteristics were obtained for the model under different saturated configurations. The results clearly indicate that the aquifer characteristics change as dewatering takes place.

W73-04065

GROUND-WATER LEVELS IN THE SOUTH PLATTE RIVER VALLEY OF COLORADO, 1968-72.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W73-04211

SEEPAGE FROM SHALLOW RESERVOIR,
Canterbury Univ., Christchurch (New Zealand).
Dept. of Civil Engineering.
For primary bibliographic entry see Field 04A.
W73-04221

DISPERSION FROM PIT IN UNIFORM SEEPAGE,
Canterbury Univ., Christchurch (New Zealand).
Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-04222

NONUNIFORM GROUNDWATER-CONDUIT DISCHARGE AND HEAD LOSS.
University of Southern California, Los Angeles.
Dept. of Civil Engineering.
S. S. Butler, and D. L. Gundlach.
University of Southern California Sea Grant Program Publication No USC-SG-1-72, January 1972.
19 p, 6 fig, 2 tab, 3 ref, 4 append. USDC-NSG-Grant (2-35227).

Descriptors: *Groundwater movement, *Non-uniform flow, *Coasts, *Saline water intrusion, *Mathematical studies, Equations, Saline water-freshwater interfaces, Hydraulic gradient, Head loss, Aquifers, Model studies.
Identifiers: *Conduit discharge.

The subject of groundwater flow is important in coastal studies because of the effect of outflowing fresh water on the ecology along ocean beaches, the loss of valuable fresh water to the ocean, and the intrusion of sea water into coastal aquifers. Using rational approaches verified by laboratory testing, it is possible to predict groundwater discharge and water levels for nonuniform confined groundwater conduits. A model simulating various types of nonuniform conduits was constructed at the University of Southern California Hydraulic Research Laboratory. The test results verified equations for the truncated wedge and for the truncated pyramid. (Woodard-USGS)
W73-04362

ELEVATION CHANGES DUE TO TIDES, LONG BEACH, CALIF.
Long Beach Dept. of Oil Properties, Calif.
For primary bibliographic entry see Field 04B.
W73-04369

WATER SUPPLY FOR THE NUCLEAR ROCKET DEVELOPMENT STATION AT THE U.S. ATOMIC ENERGY COMMISSION'S NEVADA TEST SITE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-04370

COMPARISON OF RECHARGE TO GROUND-WATER UNDER PASTURE AND FOREST USING ENVIRONMENTAL TRITIUM,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Soils.
G. B. Allison, and M. W. Hughes.

Journal of Hydrology, Vol 17, No 1-2, p 81-95, October 1972. 3 fig, 2 tab, 20 ref. IAEA Contract 323/R/IRB.

Descriptors: *Water balance, *Evapotranspiration, *Infiltration, *Recharge, *Tracers, Tritium, Vegetation effects, *Australia, Pine trees, Soil water, Soil moisture, Sampling.

Recharge to groundwater under pasture and forest at a site on the Gambier Plain, southern Australia, was investigated by using environmental tritium as a tracer. Water from the top 20 cm of the shallow unconfined aquifer was sampled at locations both in pasture and forest during October 1970 and February 1971. For several sites along a groundwater streamline, the mean tritium concentration of groundwater beneath the forest was 1.8 TU, while that under pasture was 12 TU. The mean depths to water were approximately the same for both land covers, being 6.0 m and 5.6 m, respectively. The conclusion is that there is virtually no recharge to groundwater beneath the forest, which contradicts the results of a study of water level fluctuations in the Karstic aquifer of the area. (Knapp-USGS)
W73-04373

WATER TABLE FLUCTUATIONS UNDER FOREST AND PASTURE IN A KARSTIC REGION OF SOUTHERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Soils. J. S. Colville, and J. W. Holmes.
Journal of Hydrology, Vol 17, No 1-2, p 61-80, October 1972. 8 fig, 2 tab, 11 ref.

Descriptors: *Water balance, *Evapotranspiration, *Karst hydrology, *Infiltration, *Recharge, Vegetation effects, Water level fluctuations, Mathematical models, *Australia, Water table, Pine trees, Groundwater movement.

Water table heights were measured at monthly or two-monthly intervals during 1963-65 in shallow observation boreholes in an area of about 500 sq km near Narragerry, South Australia. Part of the area was under improved pasture and part was under plantation forest (*Pinus radiata*). The purpose was to find how plant cover affected the groundwater recharge. Water discharges from the upper limestone aquifer into a lower aquifer. Simplified mathematical models were compared with the observed amplitude and phase of the water table fluctuation and it was concluded that some recharge occurs beneath forest as well as grassland. Recharge beneath forest was less than half of that below pasture. (Knapp-USGS)
W73-04374

GROUND WATER RECONNAISSANCE IN THE ARGHANDAB RIVER BASIN NEAR KANDAHAR, AFGHANISTAN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-04379

AN ATTEMPT AT ESTIMATING THE TRANSMISSIBILITIES OF TRAPPAN AQUIFERS FROM SPECIFIC CAPACITY VALUES,
Central Groundwater Board, Nagpur (India). P. G. Adyalkar, and V. V. S. Mani.
Journal of Hydrology, Vol 17, No 3, p 237-241, November 1972. 2 tab, 9 ref.

Descriptors: *Transmissivity, *Specific capacity, *Hydrogeology, *Groundwater movement, *Thiem's equation, Basalts, Aquifer characteristics, Water yield, Drawdown, Aquifer testing. Identifiers: *India.

Based on Thiem's equilibrium formula, an attempt is made to arrive at an empirical factor for the determination of transmissibility. Multiplying the factor by the specific capacity values of the wells

tested gives an average value for T for unconfined water-table aquifer conditions in basalt terrains. The suitability of this method with particular reference to poorly permeable water-table aquifers in Maharashtra in India is discussed. (Knapp-USGS)
W73-04527

METHODS FOR THE CALCULATION OF TRUE FORMATION FACTORS IN THE BUNTER SANDSTONE OF NORTHWEST ENGLAND,
Birmingham Univ. (England). Dept. of Geology and Geophysics. P. F. Worthington, and R. D. Barker.
Engineering Geology, Vol 6, No 3, p 213-228, October 1972. 10 fig, 4 tab, 16 ref.

Descriptors: *Electrical well logging, *Electrical studies, *Resistivity, *Conductivity, *Sandstones, Aquifer testing, Permeability, Aquifer characteristics, Clay minerals.
Identifiers: *Formation factor, Bunter Sandstone (England).

In the Bunter Sandstone from the Fylde area of northwest Lancashire, England, measured values of the formation factor exhibit a marked variation with variation of the concentration of the saturating electrolyte as a result of the conductivity of the rock matrix. The least squares method is used to represent this variation in terms of specified first- and second-order equations. From these expressions a true formation factor can be calculated. The field application of this parameter in hydrogeological studies of these sandstones is briefly discussed. (Knapp-USGS)
W73-04534

2G. Water in Soils

WATER USE EFFICIENCY OF VEGETABLE CROPS GROWN OVER ASPHALT MOISTURE BARRIERS,
Delaware Univ., Newark. Water Resources Center.
For primary bibliographic entry see Field 03F.
W73-03902

ELECTROMAGNETIC PULSE SOUNDING FOR SURVEYING UNDERGROUND WATER,
Ohio State Univ., Columbus. Water Resources Center.
For primary bibliographic entry see Field 07B.
W73-03912

WATER PERMEABILITY OF FROZEN SOIL IN CONNECTION WITH ANTIEROSION CONSERVATION TILLAGE OF FALL-PLOWED SOIL ON SLOPES, (IN UKRAINIAN),
M. P. Spinul, I. Y. Fedan, and I. A. Pabat.
Visn Sil's' kohospod Nauk. 5, p 41-44, 1970.
Identifiers: *Erosion control, Fall, *Frozen soils, *Permeability, Plowed fields, Slopes, Soils, Tillage, Weather.

The water permeability of frozen fall-plowed soil was studied for two years, with ordinary tillage and with disk-dibbler LOD-10 on a northwestern slope in the Dnepropetrovsk region on common low-humus medium-loamy medium-eroded Chernozem. In 1967, at the beginning of snowmelt, the disk-dibbler fall-plowed soil received 24.5 mm water in 2 hr, while common fall-plowed soil received no water at all; at the end of snowmelt, they received 4.5 and 0 mm, respectively. The corresponding results for 1968 were 79.0 and 63.0 mm, respectively, for disk-dibbler cultivated soil, as against 27.0 and 0.5 mm for the common fall-plow. The water permeability of frozen fall-plowed soil is strongly influenced by water conditions preceding the snowmelt, moisture saturation in the

WATER CYCLE—Field 02

Water in Soils—Group 2G

profile and the tillage techniques used for the fall-plowed soil. The runoff of snowmelt was much less on the disk-dibbler fall-plowed soil than on common fall-plowed soil.—Copyright 1972, Biological Abstracts, Inc.
W73-03916

USE OF INFORMATION ON THE AGROHYDROLOGICAL PROPERTIES OF SOIL IN THE COMPUTATION OF MOISTURE RESERVES IN FARM FIELDS, (IN RUSSIAN),
For primary bibliographic entry see Field 03F.
W73-03917

EFFECTS OF SOIL TEXTURE ON EVAPORATIVE LOSS AND AVAILABLE WATER IN SEMI-ARID CLIMATES,
Kansas State Univ., Manhattan. Div. of Biology.
For primary bibliographic entry see Field 02D.
W73-03952

DYNAMICS OF THE WATER AND CHEMICAL PROPERTIES OF TYPICAL AND PODZOLIZED BROWN FOREST SOILS IN THE MARITIME TERRITORY (IN RUSSIAN),
N. A. Kreida, and A. K. Vasileva.
Vestn Leningr Univ. 9, p 160-166. 1970. English summary.
Identifiers: *Chemical properties, *Forest soils, *Podzolized soils, USSR.

The water status of soils in broadleaved-Siberian pine forests depends upon the relief and texture of the soil-forming rocks. Typical brown forest soils develop under predominantly oxidizing conditions (periodic waterlogging is limited to horizons Al and A1A2), while periods of superficial waterlogging and anaerobiosis produced the podzolized varieties. An increase in the soil moisture contents is accompanied by increases in ferrous Fe, acidity and oxidizability of soil solutions. The soil solution of typical brown forest soils differs from that of podzolized brown forest soils in its lower acidity (pH 6.4-7.1), lower oxidizability, higher hydro-bicarbonate content, absence of water-soluble Fe (which occurred in podzolized brown soil at 1.6 and 4.4 mg/l), and higher contents of alkali and alkaline earth metals.—Copyright 1972, Biological Abstracts, Inc.
W73-03955

NON-LINEAR THERMODYNAMICS OF SOIL-WATER-HEAT SYSTEMS,
Haryana Agricultural Univ., Hissar (India). Dept. of Physics.
R. Pal, and M. P. Gupta.
Journal of Hydrology, Vol 11, No 3, p 313-315. March, 1970. 8 ref.

Descriptors: *Hydrology, *Soil physics, *Soil water, *Thermodynamics, Soil temperature, Heat transfer.
Identifiers: *Soil-water-heat systems.

Evaluation of the second order phenomenological coefficients in soil-water-heat system as suggested by Srivastava and Abrol is examined and discrepancy therein reported. (Skogerboe-Colorado State)
W73-03960

THERMODYNAMICS OF SOIL-WATER SYSTEM,
Haryana Agricultural Univ., Hissar (India). Dept. of Physics.
R. Pal, and M. P. Gupta.
Journal of Hydrology, Vol 13, No 3, p 278-280. September, 1971. 8 ref.

Descriptors: *Hydrology, *Soil physics, *Soil water, *Thermodynamics, Soil temperature, Heat transfer.
Identifiers: *Soil-water-heat systems.

Nonequilibrium thermodynamic theory as applied to soil-water-heat system by Taylor and Cary is examined and discrepancy therein reported. (Skogerboe-Colorado State)
W73-03961

ISOTOPIC EXCHANGE STUDIES OF MICRONUTRIENTS IN SOILS,
P. L. Lopez, and E. R. Graham.
Soil Science, Vol 110, No 1, p 24-30, July, 1970. 4 tab, 16 ref.

Descriptors: *Soil chemistry, *Inorganic compounds, *Soil management, Soil structure, Groundwater, Fertility.
Identifiers: *Micronutrients, *Soil fertility.

Three soil samples of Mexico silt loam with pH of 5.0, 6.6, 7.4 were used. The equilibrium concentration in solution and the reserve amounts in the solid phase of Mn, Fe, Zn, and Cu were determined by isotopic exchange. The ionic pool of each element was calculated from these values. Factors affecting the determination, such as pH of the soil and the extractant, drying treatments, composition of extraction solutions, and equilibration time to reach a steady state were included. (Skogerboe-Colorado State)
W73-03963

RELATION BETWEEN ENERGY AND ERROR DUE TO NUCLEAR STATISTICS FOR DENSITY MEASUREMENT BY GAMMA RAY TRANSMISSION,
Negev Inst. for Arid Zone Research, Beersheba (Israel).
For primary bibliographic entry see Field 08D.
W73-03964

SOIL HYDRAULIC CONDUCTIVITY AND BULK VOLUME CHANGES DURING CYCLIC CALCIUM-SODIUM EXCHANGE,
California Univ., Berkeley.
For primary bibliographic entry see Field 02K.
W73-03965

A RAPID METHOD OF MEASUREMENT OF DIFFUSION COEFFICIENTS IN AQUEOUS SOLUTIONS,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 02K.
W73-03966

A COMPUTER ANALYSIS ON THE LEACHING OF BORON FROM STRATIFIED SOIL COLUMNS,
California Univ., Davis.
K. K. Tanji.
Soil Science, Vol 110, No 1, p 44-51, July, 1970. 3 fig, 15 ref.

Descriptors: *Leaching, *Computer models, *Boron, Ion transport, Drainage, Percolation, Salt balance, Soil management, *Computer programs.
Identifiers: *Stratified soil column.

A computer method was developed to predict desorption and movement of boron from laboratory columns. The Fortran program considers the Langmuir adsorption isotherm for the sorption-desorption process and a chromatographic equation for the displacement of soluble boron. Substantial computer predictions were obtained on the leaching of native soil boron from three 68.6 cm. columns stratified with respect to soluble and adsorbed boron, Langmuir constants, and water content. These predictions included boron content in the effluent and changes in profile distribution with varied amounts of leaching. (Skogerboe-Colorado State)
W73-03967

RAPID MEASUREMENT OF HYDRAULIC CONDUCTIVITY CHANGES IN SLOWLY PERMEABLE SOILS,
Agricultural Research Service, Fresno, Calif.
H. I. Nightingale, and W. C. Bianchi.
Soil Science, Vol 110, No 4, p 221-228, October, 1970. 5 fig, 4 tab, 10 ref.

Descriptors: *Hydraulic conductivity, *Saturated flow, Groundwater movement, Permeability, Porous media, Measurement, Laboratory tests, *Permeameters.
Identifiers: *Hydraulic conductivity measurement, *Slowly permeable soils.

The strain gage permeameter was described which, along with supporting equipment, provides a laboratory measurement of low saturated conductivity of a confined soil layer. Hydraulic conductivities in the range from above 0.01 to 0.00001 cm/day can be determined in about 2 to 50 minutes, respectively. Values less than 0.01 cm/day should be determined with a strip chart millivolt recorder to resolve the falling head-time relationship with acceptable accuracy. The support equipment was designed primarily to study the effect of water quality on the time rate of change in hydraulic conductivity of slowly permeable soil material under a loaded conditions. (Skogerboe-Colorado State)
W73-03968

THE EFFECT OF ENTRAPPED AIR ON THE HYSTERESIS CURVES OF A POROUS BODY AND ON ITS HYDRAULIC CONDUCTIVITY,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
A. Poulovassilis.
Soil Science, Vol 109, No 3, p 154-162, March, 1970. 8 fig, 3 ref.

Descriptors: *Hysteresis, *Groundwater movement, *Porous media, *Hydraulic conductivity, Soil moisture, Time lag, Viscosity.
Identifiers: *Entrapped air.

Due to the entrapped air, a family of drying curves occurs between the saturation and the ultimate boundary drying curves for a porous body. This makes it possible to obtain a family of primary wetting curves for which the starting point for each is defined by the same suction but lies on one of various drying curves, as well as to measure the hydraulic conductivity along numerous drying curves. Results are reported and explained. (Skogerboe-Colorado State)
W73-03969

THE CONCENTRATION OF K, CA, AND MG IN THE SATURATION EXTRACT IN RELATION TO EXCHANGEABLE K, CA, AND MG,
Landwirtschaftliche Forschungsanstalt, Buenstehof (Germany).
For primary bibliographic entry see Field 02K.
W73-03970

MEASUREMENT OF UNSATURATED CONDUCTIVITY AND DIFFUSIVITY BY INFILTRATION THROUGH AN IMPEDED LAYER,
Wisconsin Univ., Madison.
D. Hillel, and W. R. Gardner.
Soil Science, Vol 109, No 3, p 149-153, March, 1970. 2 fig, 10 ref.

Descriptors: Soil science, *Soil moisture, *Unsaturated flow, *Conductivity, *Diffusivity, *Infiltration, *Measurement, On-site tests.
Identifiers: *Impeded layer, Soil crust.

A method is described for measuring the hydraulic transmission properties of a soil column as a function of water content. It involves a series of infiltration trials through capping plates (or crusts) of different hydraulic resistance to induce the

Field 02—WATER CYCLE

Group 2G—Water in Soils

development of a suction at the surface. An actual measurement of the capillary conductivity is obtained by allowing the process to proceed to the steady stage, and the use of progressively impeding plates give progressively smaller conductivity values corresponding to lower water contents. (Skogerboe—Colorado State) W73-03971

AIR PERMEABILITY AS RELATED TO PARTICLE SIZE AND BULK DENSITY IN SAND SYSTEM, Alexandria Univ. (Egypt).

M. M. Elgabaly, and W. M. Elghamry. Soil Science, Vol 110, No 1, p 10-13, July 1970, 1 fig, 2 tab, 16 ref.

Descriptors: *Porous media, *Permeability, Porosity, *Particle size, *Bulk density, Mathematical models, Permeameters, *Sands. Identifiers: *Air permeability, Sand systems.

A system was devised to measure the air permeability of several samples of sand. From these data, two mathematical models were developed to predict the air permeability of samples based on the particle size distribution. Equations were then written and their solutions obtained. (Skogerboe—Colorado State) W73-03972

ANION EXCLUSION EFFECTS ON CHLORIDE MOVEMENT IN SOILS, Kentucky Univ., Lexington.

For primary bibliographic entry see Field 02K. W73-03973

INFLUENCE OF VARIOUS TREATMENTS ON THE DISSOLUTION OF DICALCIUM PHOSPHATE IN SOILS, California Univ., Riverside.

For primary bibliographic entry see Field 05B. W73-03974

TRANSIENT INFILTRATION INTO CRUST-TOPPED PROFILES, Hebrew Univ., Jerusalem (Israel).

D. Hillel, and W. R. Gardner. Soil Science, Vol 109, No 2, p 69-76, February, 1970, 4 fig, 8 ref.

Descriptors: *Infiltration rates, *Soil water movement, Soil physical properties, Soil management, Soil surfaces, *Soil profiles. Identifiers: *Crust-topped profiles, Soil-water relations.

A theory is presented which describes transient infiltration into both uniform and crust-capped profiles of initially dry soil. Applications of the Green and Ampt assumptions are discussed. Experimental data are shown which indicate that the cumulative infiltration curves of crusted profiles scale as the square root of their transmission-zone diffusivities. Thus, infiltration into a crusted profile can be described by the approximation that water enters into the subcrust soil at a nearly constant suction, the magnitude of which is determined by the crust resistance and the hydraulic characteristics of the soil. (Skogerboe—Colorado State) W73-03976

NATURE OF SOILS AND PATTERNS OF THEIR DISTRIBUTION IN THE KYRA DISTRICT, CHITA REGION, (IN RUSSIAN), A. A. Khatulev, and A. A. Vedenina.

Uch Zap Leningr Gos Univ. 348, p 28-42, 1969. Identifiers: *Chita region (USSR), *Distribution (Plants), Kyra, Patterns, Physicochemical soil properties, *Soils, Texture, USSR.

The district has a large variety of landscapes. Gravely and pebbly noncalcareous chernozems are predominant in the intermontane depressions. River terraces above the floodplain are covered with meadow chernozem pebbly soils with calcareous concentrations in the upper layer. Bogged soils are formed on the bottom of deep narrow valleys. The slopes of mountain ridges are dominated by sod forest, forest steppe, sod taiga nonpodzolic and podzolic soils. Data are provided on the texture and certain physicochemical properties of chernozem, gray forest and sod taiga (brown) soils. —Copyright 1972, Biological Abstracts, Inc. W73-03977

SOIL-WATER RELATIONSHIP, For primary bibliographic entry see Field 03F. W73-03981

CALCULATION OF ELECTRICAL CONDUCTIVITY FROM SOLUTION COMPOSITION DATA AS AN AID TO IN-SITU ESTIMATION OF SOIL SALINITY, Agricultural Research Service, Riverside, Calif. Salinity Lab.

B. L. McNeal, J. D. Oster, and J. T. Hatcher. Soil Science, Vol 110, No 6, p 405-414, December, 1970, 2 fig, 6 tab, 12 ref.

Descriptors: *Electrical conductance, *Soil chemical properties, *Salinity, *Saline soils. Identifiers: Electrical conductivity calculation, Salinity sensors, Saturation extract.

Several methods for calculating the electrical conductivity (EC) of mixed salt solutions have been developed and tested on saturation extract data from 193 soils. Most methods were based on the additivity of values for individual ion EC in both single-salt and mixed-salt solutions. Calculated and measured EC commonly agreed to within plus or minus 0.2 mmhos/cm up to 4-6 mmhos/cm, and to within plus or minus 1.0 mmhos/cm up to 15-40 mmhos/cm, depending upon the method used. A single third-order polynomial for each ion proved satisfactory for predicting the EC of most single salt solutions containing the ion and a counter-ion. Correction factors had to be applied when using these equations for mixed-salt solutions. (Skogerboe—Colorado State) W73-03984

DETERMINATION OF A WATER TABLE IN A SOIL PROFILE USING THE PLATINUM OXYGEN CATHODE, Department of Agriculture, Ferntree Gully (Victoria), Scoresby Horticultural Research Station.

D. W. West, and J. D. F. Black. Soil Science, Vol 110, No 2, p 119-123, August, 1970, 3 fig, 1 tab, 8 ref.

Descriptors: *Water table, *Groundwater, Soil water, Saturated soils, *Soil profiles, *Cathodes. Identifiers: Water table determination, *Platinum oxygen cathode, *Soil oxygen flux.

The techniques of measuring soil oxygen flux with the platinum cathode have been applied to the determination of oxygen deficient, water saturated zones in soil profiles. Measurements were taken at depth intervals through the profile to locate the large change in flux which occurs on moving the electrode from the unsaturated into the saturated soil zone. For most satisfactory use of the technique the transition zone should occur over a narrow depth interval. As the purpose of the technique does not require measurement of the precise oxygen flux, modification of the usual procedure for measuring equilibrium soil oxygen flux is suggested to increase the sensitivity of the determination. (Skogerboe—Colorado State) W73-03985

THE EFFECT OF ELECTROLYTE COMPOSITION ON HYDRAULIC CONDUCTIVITY OF CERTAIN TEXAS SOILS, Ahwaz Agricultural Coll. (Iran). B. Naghsineh-Pour, G. W. Kunze, and C. D. Carson. Soil Science, Vol 110, No 2, p 124-127, August, 1970, 5 fig, 1 tab, 13 ref.

Descriptors: *Soil chemistry, Inorganic compounds, Soil management, Soil structure, Groundwater, *Hydraulic conductivity, *Sodium, *Calcium, *Clays, Loam.

Identifiers: *Sandy loams.

Four well characterized soils—Houston Black clay, Beaumont clay, Katy fine sandy loam, and the Nacogdoches fine sandy loam—were studied. Factors such as sodium-absorption ratio, exchangeable sodium percentage, electrolyte concentration, clay content, free iron oxides, and clay mineral species are all important factors involved in the hydraulic conductivity of the soils of this study. The most important single factor for the contrasting soils reported is soil mineralogy. The results point out the importance of excluding sodium from the soil system and maintaining a calcium-saturated exchange complex for the soil with high montmorillonite content. (Skogerboe—Colorado State) W73-03986

AGROPHYSICAL CHARACTERISTICS OF ORDINARY CHERNOZEMS IN EASTERN KAZAKHSTAN, (IN RUSSIAN), V. F. Dorogan. Tr Kaz Nauchno-Issled Inst Zemled. 9, 10, p 317-326, 1970.

Identifiers: Aggregation, Agrophysical characteristics, *Chernozems, Hygroscopicity, *Kazakhstan, *Soil moisture, Soils, USSR.

The chernozems possess high aggregation resulting in favorable hydrophysical properties. Maximum hygroscopicity varies between 7.5 and 10.5% while wilting percentage is 9-12.7%. The soil possesses a wide range of active moisture (20-22 vol. % in the humus horizon), high moisture capacity and good water permeability. The water regime of ordinary chernozem is of the continuous type, steppe class. Beneath its annual wetting layer, the soil profile of plowland forms a layer of permanently high moisture content approaching field capacity. It is therefore feasible to distinguish the group of cultivated soils on the basis of their water regime. The capillary influx of moisture to the evaporation and root desiccation zone is limited to 0.75-0.18% of field capacity. The state of moisture in the chernozem is medium mobile (in the interval between field capacity and capillary break moisture) and poorly mobile (between capillary break moisture and wilting point) for most of the growing season. Data are presented on the soil moisture regime in fields with rotation.—Copyright 1972, Biological Abstracts, Inc. W73-03996

THE POSSIBILITY OF ESTIMATING THE SOIL MOISTURE RESERVE FROM PRECIPITATION DATA (IN RUSSIAN), For primary bibliographic entry see Field 02B. W73-04019

FORMS OF NITROGEN IN THE VOLCANIC SOILS OF SIBUNDY (IN SPANISH), Narino Univ., Pasto (Colombia). Instituto Technologico Agricola. For primary bibliographic entry see Field 05B. W73-04032

TOPSOIL REACTION TO MECHANICAL PRESSURE, G. Berthsson.

WATER CYCLE—Field 02

Water in Soils—Group 2G

Swed J Agric Res. Vol 1, No 3, p 179-189. 1971. Illus.
Identifiers: Compaction, Mathematical models,
*Mechanical pressure, Pressure, *Soil compaction, *Top soil.

Studies on soil compaction on 4 plastic soils were undertaken by means of a confined compression test. Comparisons were made with the effect of tractor compaction in field trials. A maximum compatibility occurred at a water content near the lower plastic limit of the soil. However, the compaction effects in the field were greater the higher the water content was at the time of compaction. The structural deterioration overshadowed the real compaction effects and the reduction in compatibility of high water contents is of no significance in practical agriculture. The relationship between porosity (n) and pressure (p) could be expressed the equation $n \pm -A \cdot \log p + B$. The validity of this equation is discussed. It is proposed that the entire compaction curve is composed of 3 parts: at low pressures: build-up of pressure with little compaction; compaction phase, where the above equation is valid; consolidation phase. This model and some practical implications are discussed.—Copyright 1972, Biological Abstracts, Inc.
W73-04057

FACTORS AFFECTING PLANT UPTAKE AND PHYTOTOXICITY OF CADMIUM ADDED TO SOILS,
Department of Agriculture, Agassiz (British Columbia) Research Station.
For primary bibliographic entry see Field 05B.
W73-04058

DETERMINATION OF THE MOISTURE DENSITY AND THE WATER CONTENT VARIATION OF A SOIL BY MEASURING THE ABSORPTION OF GAMMA RAYS, (IN GERMAN),
Niedersaechsisches Landesamt fuer Bodenforschung, Hanover (West Germany).
S. Lorch.

Z Pflanzenearnahr Bodenk. Vol 130, No 2, p 136-151. 1971. Illus. English summary.
Identifiers: Absorption, Density, Gamma-rays (Absorption), Measuring techniques, *Soil moisture, *Water content (Soils).

A collimated gamma-ray (^{137}Cs) is measured according to the absorption principle. Two tubes are inserted into the soil parallel to each other and about 50 cm apart. In one tube is a gamma-ray source, and in the other a detector simultaneously moves step by step in a homogeneous manner up and down. The density and the changing of the water content is calculated from the measured counting rate. The measuring time for each step is variable, usually about 5-10 min. The accuracy of the instrument in field use amounts to: change in water content: plus or minus 0.0015 g/cm³; soil density: plus or minus 0.003 g/cm³. The solution power is such that horizontal layers of about 10 mm thickness can be distinguished with respect to changing water content.—Copyright 1972, Biological Abstracts, Inc.
W73-04072

PREDICTING SOIL MOISTURE IN THE SOUTHERN APPALACHIANS,
Forest Service (USDA), Wenatchee, Wash. Forest Hydrology Lab.
J. D. Helvey, J. D. Hewlett, and J. E. Dowless.
Soil Science Society of America Proceedings, Vol 36, No 6, p 954-959, November-December 1972. 7 fig, 3 tab, 8 ref.

Identifiers: *Soil moisture, *Appalachian Mountain Region, *Equations, Infiltration, Slopes, Rainfall, Water balance, *North Carolina.

Identifiers: *Soil moisture forecasting.

Soil moisture was measured on forested slopes in the mountains of western North Carolina to develop equations for predicting soil moisture content of watersheds. Predictors used were precipitation and easily measured topographic, seasonal, and soil physical factors; among these, sand content and moisture retention at 1-bar suction were the best. Height or distance from the stream channel appeared to be an important factor only in the lower 25% of the slope. The annual cycle of soil moisture in the top 213 cm approximated a sine wave with a maximum during mid-April and a minimum during mid-October. Moisture changes in surface layers were correlated best with the previous day's rainfall. Changes in deeper layers were better correlated with rainfall during previous weeks. Equations developed account for about 88% of the variation in soil moisture. (Knapp-USGS)
W73-04086

SOIL AIR PRESSURE AND WATER INFILTRATION UNDER BORDER IRRIGATION,
Agricultural Research Service, Reno, Nev.
R. M. Dixon, and D. R. Linden.
Soil Science Society of America Proceedings, Vol 36, No 6, p 948-953, November-December 1972. 7 fig, 11 ref.

Identifiers: *Infiltration, *Border irrigation, *Edge effect, *Soil water movement, Wetting, Pressure, Mixing, Hydraulic conductivity, Pores, Interstices.
Identifiers: *Soil air displacement, *Soil air pressure.

Soil air pressure and water infiltration were measured during actual and simulated border irrigation of a uniform loam soil having a water table about 2 m beneath the surface. Displaced air pressure decreased downslope and across slope from center to edge of the border strips. A maximum displaced air pressure of 21 cm of water was observed in the upslope central part of the border strip. Air entrainment commonly occurred at a 50-cm depth next to border dikes but rarely occurred midway between dikes, which implies that water penetration was greatest in the region of lowest displaced air pressure. Displaced air pressure, building to a maximum of about 19 cm, reduced total infiltration by about one-third. Such pressure appears to impede infiltration mainly by preventing or retarding direct flow of surface water into and within open macropores. In the central region of the border strip where displaced air pressure exceeds the surface water head, macropores vent displaced soil air upward; whereas along the border dikes where surface head exceeds air pressure, macropores conduct free surface water downward. Soil air pressure and its infiltration effects are not negligible as is commonly assumed by Darcy-based flow theory, and soil air can be a useful tool for controlling infiltration in some important situations. (Knapp-USGS)
W73-04087

IRON AND SILICA IN WATER, ACID AMMONIUM OXALATE, AND DITHIONITE EXTRACTS OF SOME NORTH CAROLINA COASTAL PLAIN SOILS,
Soil Conservation Service, Raleigh, N.C.
E. E. Gamble, and R. B. Daniels.
Soil Science Society of America Proceedings, Vol 36, No 6, p 939-943, November-December 1972. 1 fig, 2 tab, 16 ref.

Identifiers: *Soil chemistry, *Iron, *Silica, *Mineralogy, Water table, Soil water, Hydrates, Hydration, *North Carolina.

Sequential water, oxalate, and dithionite extracts of a Paleaquit and two Paleudults were analyzed for iron and silica. The ratio of oxalate iron to dithionite iron (active iron ratio) suggests that there is little accumulation of amorphous iron

compounds in the Paleudults. Goethite may be the main iron oxide mineral. The active iron ratio in the gray matrix of the Paleaquit shows that the fine yellowish or brownish flecks and mottles contain a high proportion of amorphous iron compounds that have not aged sufficiently to become crystalline. These iron compounds may be associated with the seasonal variations of water table depth. The silica extracted, especially by the dithionite, probably comes directly from the quartz sand and kaolinitic clay rather than from dissolution of iron compounds. (Knapp-USGS)
W73-04088

WATER MOVEMENT IN UNDISTURBED SWELLING CLAY SOIL,
Agricultural Research Service, College Station, Tex.

J. T. Ritchie, D. E. Kissel, and E. Burnett.
Soil Science Society of America Proceedings, Vol 36, No 6, p 874-879, November-December 1972. 5 fig, 1 tab, 8 ref.

Identifiers: *Soil water movement, *Expansive soils, *Expansive clays, *Fracture permeability, Cracks, Laboratory tests, Tracers, Dye releases, Hydraulic conductivity.

Hydraulic conductivities of Houston Black clay were measured in two field basins, in relatively large undisturbed cores, and in small disturbed cores. Conductivities averaged about 2.5 cm/day for the field basins but were about 10 times less for the core samples. Using water tagged with fluorescein to displace deionized water in an undisturbed core, pores in distinctive isolated areas were found to be conducting most of the water. Water contained within structural units appeared to be inactive in the flow process when compared to water flow around the units. (Knapp-USGS)
W73-04089

SOLUTIONS FOR MISCELLANEOUS DISPLACEMENT OF SOIL WATER WITH TIME-DEPENDENT VELOCITY AND DISPERSION COEFFICIENTS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.

A. W. Warrick, J. H. Kichen, and J. L. Thamnes.
Soil Science Society of America Proceedings, Vol 36, No 6, p 863-867, November-December 1972. 3 fig, 2 tab, 12 ref.

Identifiers: *Infiltration, *Ion transport, *Mass transfer, *Soil water movement, Dispersion, Mixing, Aqueous solutions, Path of pollutants, Unsaturated flow, Percolation.

Miscible displacement processes with time-varying velocity and dispersion coefficients are examined. Simplified solutions utilizing arbitrary initial conditions are presented and used to simulate step and slug inputs of solutes into soil during infiltration of water. The solutions are used in the analysis of experimental data, both for field infiltration with a slug of solute and for psychrometric measurements of salt fronts in a laboratory sand column. Experimental data obtained for solute movement were more accurately described using time-increasing dispersion relationships than for constant values. (Knapp-USGS)
W73-04090

THE NUMERICAL ANALYSIS OF INFILTRATION INTO HETEROGENEOUS POROUS MEDIA,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.

F. D. Whisler, K. K. Watson, and S. J. Perrens.
Soil Science Society of America Proceedings, Vol 36, No 6, p 868-874, November-December 1972. 10 fig, 7 ref.

Field 02—WATER CYCLE

Group 2G—Water in Soils

Descriptors: *Infiltration, *Soil water movement, *Water spreading, Recharge, Numerical analysis, Hydraulic conductivity, Porous media, Unsaturated flow, Saturated flow.
Identifiers: Ponded infiltration.

Ponded infiltration into a heterogeneous porous medium was studied using a numerical solution of the flow equation. The medium was assumed to exhibit scale heterogeneity, the heterogeneity being specifically defined in terms of a linear variation of the saturated hydraulic conductivity with depth. The spatial variation of the hydrologic characteristics was initially defined in terms of the water entry value of the medium at the point in question and an empirical relationship between the water entry value and the saturated hydraulic conductivity. Pressure head and water content profiles were obtained for two hydraulic conductivity distributions and compared with that for a homogeneous soil having an average conductivity. The profiles reveal distinct regions that are different from the uniform case depending on whether the conductivity is increasing or decreasing with depth. (Knapp-USGS)
W73-04091

HORIZONTAL INFILTRATION INTO LAYERED SOILS,
California Univ., Davis. Dept. of Water Science and Engineering.
K. Reichardt, D. R. Nielsen, and J. W. Biggar.
Soil Science Society of America Proceedings, Vol 36, No 6, p 858-863, November-December 1972. 10 fig, 1 tab, 11 ref.

Descriptors: *Infiltration, *Soil water movement, Percolation, Diffusivity, Wetting, Hydraulic conductivity, Stratification, Numerical analysis, Soil physical properties.
Identifiers: *Infiltration (Horizontal).

A numerical solution of the soil water movement equation is presented for horizontal infiltration into air-dry layered soils. The solution is based upon a scaled soil water diffusivity function common to six homogeneous soils and values of the microscopic characteristic length ascertained for each soil from homogeneous columns. Soil water content distributions and cumulative infiltration for different sequences of soil layers are analyzed. Agreement between experimental and theoretical infiltration profiles suggests a convenient means to study the influence of texture and hydraulic characteristics of different layers on the infiltration process. (Knapp-USGS)
W73-04092

INFLUENCE OF WATER CONTENT ON ELECTRICAL CONDUCTIVITY OF THE SOIL,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
S. C. Gupta, and R. J. Hanks.
Soil Science Society of America Proceedings, Vol 36, No 6, p 855-857, November-December 1972. 3 fig, 2 tab, 6 ref.

Descriptors: *Electrical studies, *Soil water, *Salinity, *Soil moisture meters, Mass transfer, Electrical conductance, Conductivity, Geophysics, Moisture content.

The four-probe system of measuring electrical conductivity of soil eliminates the time lag error, but introduces the problem of correcting the changes in conductivity caused by water content. Regression equations developed to estimate saturation or 1:5 extract electrical conductivity from four-probe conductivity and water content gave correlation coefficients of 0.75 and 0.90, respectively. Correlations for individual soils were generally higher than the combined soils. The regression equation relating the ratio of four-probe conductivity to four-probe conductivity at saturation with water content yields a correlation coefficient of 0.88 for the combined soil data. (Knapp-USGS)
W73-04093

client of 0.88 for the combined soil data. (Knapp-USGS)
W73-04093

FIELD MEASUREMENT OF SOIL WATER POTENTIAL WITH THERMOCOUPLE PSYCHROMETERS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
S. D. Merrill, and S. L. Rawlins.
Soil Science, Vol 113, No 2, p 102-109, February 1972. 4 fig, 18 ref.

Descriptors: *Soil moisture meters, *Instrumentation, *Calibrations, *Telemetry, Temperature, Moisture meters, Moisture availability, On-site tests.
Identifiers: *Thermocouple psychrometers.

A year-round emplacement of 40 Peltier-effect psychrometers in field plots was used to study instrumentation for collecting data on vertical distribution of water potential through the root zone in response to water use and various schemes of flood irrigation with saline waters. Both automatic and manual methods of recording data were capable of delimiting water potential dynamics in the field to within plus or minus 0.5 bar on a daily basis. Variation of apparent water potential induced by diurnal heat flux through the soil profile can adversely affect data quality at the 35-cm depth or less in sandy loam soil. Techniques for greatly attenuating the apparent diurnal effect included the placement of sealed-up psychrometer horizontally in the soil and the averaging of separate readings at 12-hr intervals to generate daily values. (Knapp-USGS)
W73-04105

THEORY OF WATER MOVEMENT IN SOILS: 4. TWO AND THREE DIMENSIONAL STEADY INFILTRATION,
Connecticut Agricultural Experiment Station, New Haven.
J.-Y. Parlange.
Soil Science, Vol 113, No 2, p 96-101, February 1972. 1 fig, 9 ref.

Descriptors: *Infiltration, *Mathematical studies, Wetting, Groundwater movement, Soil water movement, Recharge, Unsaturated flow, Percolation, Equations, Saturated flow.
Identifiers: *Infiltration from cavities.

The solution for the steady-state infiltration from a cavity was obtained analytically in two and three dimensional by a singular perturbation technique. The form of the solution depends upon a parameter which is the product of two factors. The first is a soil property that characterizes the relative importance of gravity and capillarity for that soil. The second characterizes the size of the cavity. When this parameter becomes small, gravity effects are negligible in three dimensions but not in two dimensions. Details of the method are given for a spherical cavity. The solution differs significantly from a point source solution, even for very small, but nonzero cavities. As an illustration of the flexibility of the method, the case of a cylinder that does not have a circular cross section is treated explicitly. (Knapp-USGS)
W73-04106

DYNAMICS OF THE SOIL-WATER SYSTEM DURING A RAINSTORM,
Agricultural Research Service, St Paul, Minn. Soil and Water Conservation Research Div.
D. A. Farrell, and W. E. Larson.
Soil Science, Vol 113, No 2, p 88-95, February 1972. 1 fig, 1 tab, 17 ref.

Descriptors: *Infiltration, *Impact (Rainfall), Equations, *Soil surfaces, Hydraulic conductivity, Precipitation (Atmospheric), Capillary conduction.

tivity, Wetting, Soil water movement, Moisture content, Diffusivity, Antecedent precipitation, Unsaturated flow, Saturated flow.

An equation was developed to describe infiltration into a uniform soil profile when the hydraulic conductivity of the surface layer is steadily reduced by raindrop impact during storms of moderate to high intensity. This equation was derived by assuming that the soil-water system is effectively simulated by a simple capillary model. The changing hydraulic resistance of the surface layer is specified as an exponential function of time; this triparametric expression has adequate flexibility for fitting experimental data. When the gravitational component of fluid potential has a significant effect on the movement of water through the soil, the general solution of the transport equation can be expressed in terms of the incomplete gamma function. When the capillary potential gradients greatly exceed the gravitational gradient, the general solution can be expressed in terms of the error function. The simplified analysis takes into consideration the response of the soil-water system to the rainfall intensity characteristic, the hydraulic properties of the soil, and the initial conditions. (Knapp-USGS)
W73-04107

THE CHANGEABILITY OF THE HYDRAULIC CONDUCTIVITY OF SATURATED SOIL SAMPLES,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
A. Poulovassilis.

Soil Science, Vol 113, No 2, p 81-87, February 1972. 5 fig, 1 tab, 7 ref.

Descriptors: *Hydraulic conductivity, *Soil water movement, *Wetting, Cations, Permeameters, Saturation, Saturated flow, Unsaturated flow, Microorganisms, Soil gases, Permeability, Laboratory tests.

The separate contributions to the temporal variation of hydraulic conductivity of soil samples were studied by using an oscillating-head permeameter. The main merit of such a permeameter is that it allows continuous measurement of hydraulic conductivity using the same small quantity of water. Thus cation interaction between the soil and the flowing solution is minimized. Sterilization of soil samples wetted under vacuum allowed estimation of the effect on the hydraulic conductivity of changes in pore geometry. For the sample examined the observed decrease was about 15% of the initial value. Hydraulic conductivity is affected by microorganisms as well as by changes in pore geometry. In this case the hydraulic conductivity was reduced to about 2% of the initial value, which may be explained on the basis of the gases produced by the microorganisms. Sterilized soil samples were wetted to allow air entrapment for estimation of the contribution due to changes in volume and distribution of the initially entrapped air. An increase in the value of hydraulic conductivity of about 100% of the initial value was observed. The effect of cations in the flowing solution was also studied. (Knapp-USGS)
W73-04108

AVAILABLE WATER CAPACITY OF SANDY AND GRAVELLY NORTH DAKOTA SOILS,
Bureau of Reclamation, Minot, N Dak.
E. D. Rivers, and R. F. Shipp.
Soil Science, Vol 113, No 2, p 74-80, February 1972. 1 fig, 5 tab, 21 ref.

Descriptors: *Available water, *Soil moisture, *Laboratory tests, Particle size, Moisture content, Field capacity, Moisture availability, Soil water, On-site tests.
Identifiers: *North Dakota soils.

WATER CYCLE—Field 02

Water in Soils—Group 2G

Sandy North Dakota soil profiles free of water table and stratification influences were used as the basis for studying soils having minimal AWC (available water content). The silt and silty plus very fine sand fraction have variable importance as indicators of available soil water. Neither coarse fragment specific gravity and coarse fragment bulk density as bases for volume correction for coarse fragment content should be used exclusively for all levels of coarse fragment content in soils. The results of this study verify that 1/10-bar tension values underestimate the FC (field capacity) of sands. Values of loamy sands on the lower side of the textural class are also underestimated. Laboratory tests to approximate FC for local use should be established by comparison with field determined FC values for representative soils free of water table and stratification influences. On-site evaluation of AWC of soil types and soil textural classes may be accomplished by interpolation from values determined for specific sites within the general area and by using visual estimates in correcting for the volume of coarse fragments. (Knapp-USGS)
W73-04109

STEADY-STATE EVAPORATION THROUGH NON-HOMOGENEOUS SOILS FROM A SHALLOW WATER TABLE.,
Volcani Inst. of Agricultural Research, Rehovoth (Israel).
For primary bibliographic entry see Field 02D.
W73-04110

MOUNTAIN MEADOW STEPPE SOILS OF THE CHATKAL RANGE (IN RUSSIAN),
G. I. Roichenko, and G. S. Matienko.
Izv Kirov Fil Vses O-Va Pochvoved. 5. p 57-72, 1970.
Identifiers: "Chatkal range (USSR)", Erosion, Meadows, Microbial studies, Mineralization, Morphology, "Physicochemical soil properties, Soils, "Steppe soils, USSR, Soil profiles.

Meadow steppe sub-alpine mountain soils are widespread on the slopes of the Chatkal and Sandalash ranges at elevations of 2500-3600 m under meadow steppe with low forbs. The morphological structure is distinguished by a thin soil profile, brownish (dark brown in brown sub-alpine soils) humus horizons, indistinct sod horizon, a fairly loose constitution of the entire profile, with a somewhat more compact transition horizon. The humus contents in the upper horizon are 6-8% in brown meadow steppe sub-alpine soils, 4-6% in light-brown soils, and 3-4% in weakly water-eroded soils, decreasing sharply in the subsoil horizon and gradually in the lower profile. The contents of total N are fairly high, 0.30-0.56%, and C:N ± 6 to 8.9. Fulvic acids are the main components of humus. Mobile K may reach 68 mg and mobile P 32 mg/100 g soil. Loss of sesqui-oxides in the upper horizons is due to illuviation (possibly in the course of leaching) and water erosion. A characteristic feature is the low content of microorganisms participating in the mineralization of organic substances.—Copyright 1972, Biological Abstracts, Inc.
W73-04164

EFFECT OF NITROGEN SOURCE ON CORN AND BROMEGRASS PRODUCTION, SOIL PH, AND INORGANIC SOIL NITROGEN,
Agricultural Research Service, Mandan, N. Dak.
Northern Great Plains Research Center.
For primary bibliographic entry see Field 03F.
W73-04173

THE POSSIBILITY OF OBJECTIVE CONTROL OF SOIL MOISTURE DATA (IN RUSSIAN),
V. A. Zhukov, O. D. Sirotenko, and A. F. Uodova.
Tr Inst Eksp Meteorol GI Upr Gidrometeorol Sluzhby Pri Sov Ministr SSSR. 13. p 66-73, 1970.

Identifiers: "Seasonal, "Soil moisture, "Meteorological data.

Meteorological data from 57 stations in the Ukraine, Moldavia and the Northern Caucasus for 1956-1967 were used. Synchronism was found in the fluctuations of spring moisture reserves in the soil of every station and the 4 nearest stations. A method for controlling the moisture reserve in soil is described, based on the optimal interpolation of values and the correlation matrix. Additional information on the given element field should be introduced into the control scheme for moisture reserves in the soil. The method was used for control of data on springtime moisture reserve in soil under winter crops in 1966-1968 in some southern districts of the Ukrainian SSR.—Copyright 1972, Biological Abstracts, Inc.
W73-04180

ABSORPTION OF WATER BY A SOIL FROM A CIRCULAR CYLINDRICAL SOURCE,
California State Univ., San Jose. Dept. of Civil Engineering and Applied Mechanics.

For primary bibliographic entry see Field 05B.
W73-04200

STRUCTURAL COMPOSITION AND NUTRIENT STATUS OF CALCAREOUS CHERNOZEM IN CROP ROTATION, (IN RUSSIAN),
For primary bibliographic entry see Field 03F.
W73-04224

THEORY OF WATER MOVEMENT IN SOILS: 5. UNSTEADY INFILTRATION FROM SPHERICAL CAVITIES,
Connecticut Agricultural Experiment Station, New Haven.
J. Y. Parlane.
Soil Science, Vol 113, No 3, p 156-161, March 1972, 2 fig, 9 ref.

Descriptors: "Infiltration, "Mathematical studies, Groundwater movement, Soil water movement, Recharge, Unsteady flow, Unsaturated flow, Percolation, Equations.

Identifiers: Infiltration from cavities.

An analytical technique is presented for the study of infiltration from multidimensional cavities. Near the cavity the water content can be expressed as the sum of two terms. The first is the result of absorption, the second is due to gravity. The solution reduces to known expressions both for very short and very long times and provides a proper interpolation for moderate times. The case of a spherical cavity is treated explicitly as an illustrative example. (Knapp-USGS)
W73-04225

EFFECTS OF VARIOUS SOIL FUNGI AND INSECTICIDES ON THE CAPACITY OF MUCOR ALTERNANS TO DEGRADE DDT,
Wisconsin Univ., Madison. Dept. of Entomology.
For primary bibliographic entry see Field 05B.
W73-04232

PERFORMANCE OF A FROST-TUBE FOR DETERMINATION OF SOIL FREEZING AND THAWING DEPTHS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 07B.
W73-04254

EFFECT OF THE SOIL MOISTURE CONTENT ON THE MOBILITY OF IRON AND MANGANESE (IN RUSSIAN),
E. V. Tokonozhenko, and A. A. Tkachev.
Tr Kuban S-Kh Inst. Vol 20, No 48, p 90-93, 1970.
Identifiers: Calcareous soils, Chernozem, Composting, Forests, Humus, "Iron, "Manganese, "Soil moisture.

Composted samples from the arable horizons of leached chernozem (I), a mountain forest humus calcareous soil (II) and a mountain forest brown soil (III), at 25°C and moisture contents 25, 50 and 75 wt% of soil were studied. Ferrous Fe and Mn were determined in 0.1 N H₂SO₄ extract and exchangeable Mn in 1.0 N KNO₃ extract, after 5, 10 and 30 days. The contents of mobile and exchangeable Mn increased markedly at soil moisture contents of 50% and higher. The contents of mobile Mn in soil II, with weakly alkaline reaction, continued to increase throughout the 30 days of the composting period, compared to only 10 days in chernozems. The increase of exchangeable Mn ceased after 10 days of composting. No Fe²⁺ was detected in soil II composted for 1 mo. at moisture contents of 25, 50 and 75%. In the other soils the Fe mobility increased with increase in moisture content and composting time. Mn mobility remained higher for a prolonged period in air-dried samples, after 1 mo. composting at a moisture content of 50% and higher, than in air-dried samples that were not humidified. Dynamic determinations of Mn are required for a more complete idea of its mobility in soils.—Copyright 1972, Biological Abstracts, Inc.
W73-04255

ISOTHERMAL DRYING OF STRUCTURALLY LAYERED SOIL COLUMNS,
Hebrew Univ., Rehovoth (Israel). Faculty of Agriculture.
For primary bibliographic entry see Field 02D.
W73-04256

VEGETATION OF THE MESTERS VIG DISTRICT, NORTHEAST GREENLAND: GENERAL SUMMARY AND DISCUSSION,
For primary bibliographic entry see Field 02I.
W73-04264

MOISTURE REGIME OF SOD PODZOLIC SOILS IN DIFFERENT FARMLANDS, (IN RUSSIAN),
E. F. Dul'beva.
Tr Buryat Inst Estestv Nauk Buryat Fil Sib Otd Akad Nauk SSSR. 8. p 62-69, 1970.
Identifiers: Farmlands, "Humus properties (Soil), "Podzolic soils, Sod, Soils, USSR, "Soil moisture.

Investigations were made in the southern taiga subzone, under coniferous forest, on a meadow glade, in small-leaved forest and on plowland. The humus horizon in the plowland was several times thicker than in virgin soil, the hydrolytic acidity only half the latter's, and the base saturation in the plowland 1.5 times higher than in virgin soil. The humus content in the plowland remained at the level of virgin soil. The moisture regimes of sod podzolic soils under various farmlands possess some common features due to weather characteristics. The use of a farmland affects the manner of advent of wet and dry periods. In the cool season moisture contents are high in all the farmlands, approaching field capacity-maximum water-holding capacity. In summer, the moisture content in plowland and meadow glade decreases from the surface; the moisture content of the arable layer also diminishes. The moisture minimum lies somewhat deeper under forest (10-30 cm), and desiccation involves deeper horizons.—Copyright 1972, Biological Abstracts, Inc.
W73-04269

SELENIUM ACCUMULATION IN SOILS AND IT'S ABSORPTION BY PLANTS AND ANIMALS,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 05C.
W73-04272

Field 02—WATER CYCLE

Group 2G—Water in Soils

SOME FEATURES OF THE MOUNTAIN STEPPE SOILS OF TRANS-ILI AND DZHUNGARIAN ALA-TAU IN CONNECTION WITH EROSION (IN RUSSIAN),
R. Dzhanpeisov, and N. I. Aleva.
Tr. Inst. Pochvoved Akad Nauk Kaz SSR. 19 p.
174-191. 1970.

Identifiers: Ala-Tau, Dzhungarian, *Erosion, Forests, Mountains, *Slope profiles, Soils, *Steppe soils, USSR, Zones, Soil profiles.

The mountain steppe soils are subdivided into 3 subtypes: mountain meadow steppe soils of arid southern slopes in the alpine and subalpine zones, dark mountain steppe soils of the mountain forest and mountain forest steppe zones, and light colored mountain steppe soils of the piedmont shrub and forb zone. The elementary slope profile consists of the typical mountain steppe soils of the upper slope, eroded mountain steppe soils on the middle slope, and transported mountain steppe soils on the lower slope. This differentiation is due to the hydrothermal regime, intensity of linear and sheet erosion on the different parts of slope. The erosion resistance is low and sheet erosion is well developed. The erosion control practices should be differentiated according to the vertical zones and portions of the elementary slope.—Copyright 1972, Biological Abstracts, Inc.
W73-04281

EXPERIENCES WITH THE SLUDGE PROGRAM IN THE DENVER AREA,
Denver Sewage Sludge Disposal District, Colo.
For primary bibliographic entry see Field 05D.
W73-04286

DETERMINATION OF A COEFFICIENT OF DISPERSION UNDER FIELD CONDITIONS: INTERIM REPORT,
Teledyne Isotopes, Las Vegas, Nev.
For primary bibliographic entry see Field 05B.
W73-04290

AN INVESTIGATION INTO THE DETERMINATION OF PLUTONIUM IN SOIL BY A FUSION PROCEDURE,
Mound Lab., Miamisburg, Ohio.
For primary bibliographic entry see Field 05B.
W73-04295

INFLUENCE OF PROGRESSIVE FAILURE ON SLOPE STABILITY,
National Soil Services, Inc, Houston, Tex.
For primary bibliographic entry see Field 08D.
W73-04366

LATERAL PRESSURES FROM SOFT CLAY,
Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.
For primary bibliographic entry see Field 08D.
W73-04367

THE INFILTRATION ENVELOPE: RESULTS FROM A THEORETICAL INFILTROMETER,
Agricultural Research Service, Tucson, Ariz.
Southwest Watershed Research Center.
R. E. Smith.
Journal of Hydrology, Vol 17, No 1-2, p 1-22, October 1972. 13 fig, 4 tab, 10 ref.

Descriptors: *Infiltration, *Soil water movement, *Mathematical models, Numerical analysis, Unsaturated flow, Unsteady flow, Wetting, Porous media, Equations.

The theoretical partial differential equation for unsaturated soil moisture flow may be solved by a versatile numerical scheme designed for accurate simulation of infiltration from various patterns of rainfall. This model may be used to study the inde-

pendent effects of soil type, initial soil moisture, rainfall rate and rainfall pattern. The solution is expressed as a simple parametric model for vertical infiltration. Infiltration from a suddenly ponded surface is shown to be an asymptotic limit to increasing rainfall rates. A single dimensionless formula describes the infiltration decay curves for all soils, initial conditions, and rainfall rates tested, and another dimensionless relation predicts time to ponding under arbitrary rainfall patterns as a function of infiltrated rainfall depth. The effect of initial soil moisture is well described by a simple linear effect on the normalizing time in the dimensionless system. Uses and implications of these results are discussed. (Knapp-USGS)
W73-04376

CALCULATION OF DISCHARGE FROM PARTIALLY PENETRATING WELLS IN WATER TABLE AQUIFERS IN ISOTROPIC AND ANISOTROPIC SOILS (DETERMINATION DU DEBIT DES PUITS INCOMPLETS DE NAPPES LIBRES FONCES EN TERRAIN ISOTROPE ET ANISOTROPE),
Universite Federale du Cameroun, Yaounde. Lab. of Hydraulics and Fluid Mechanics.
For primary bibliographic entry see Field 04B.
W73-04382

THE LATERAL INFLOW INTO SUBMERGED DRAINS,
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Hydraulica.
For primary bibliographic entry see Field 08B.
W73-04384

AN INDEX OF FLOOD-PRODUCING RAINFALL BASED ON RAINFALL AND SOIL MOISTURE DEFICIT,
Institute of Hydrology, Wallingford (England). Floods Study Team.
For primary bibliographic entry see Field 02A.
W73-04528

2H. Lakes

ECOLOGICAL FACTORS INFLUENCING PRODUCTION OF ALGAE IN NORTHERN PRAIRIE LAKES,
South Dakota State Univ., Brookings. Water Resources Inst.
For primary bibliographic entry see Field 05C.
W73-03909

LAKE ICE SURVEILLANCE VIA AIRBORNE RADAR: SOME EXPERIMENTAL RESULTS,
Michigan Univ., Ann Arbor. Inst. of Science and Technology.
For primary bibliographic entry see Field 07B.
W73-03937

A METHOD FOR CALCULATING WATER DEPTH, ATTENUATION COEFFICIENTS AND BOTTOM REFLECTANCE CHARACTERISTICS,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 07B.
W73-03941

THERMAL SCANNER OBSERVATIONS OVER LAKE ONTARIO,
Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.
For primary bibliographic entry see Field 07B.
W73-03949

UTILIZATION OF DEEP WATER HEAT IN RESERVOIRS FOR THE MAINTENANCE OF UNFROZEN WATER AREAS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W73-04034

IMPACT OF COOLING WATER ON LAKE TEMPERATURES,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering; and Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 05B.
W73-04037

AN INVENTORY OF THE PONDS, LAKES AND RESERVOIRS OF MASSACHUSETTS, BERKSHIRE AND FRANKLIN COUNTIES, MASSACHUSETTS UNIV., Amherst. Water Resources Research Center.

J. A. McCann, and L. M. Daly.
Available from the National Technical Information Service as PB-214 116, \$3.00 in paper copy, \$0.95 in microfiche. Massachusetts Water Resources Center Publication No 10-2, (1972). 133p, 27 ref. OWRR A-034-MASS (1).

Descriptors: *Census, *Ponds, *Lakes, *Reservoirs, *Massachusetts, Water types, Watersheds (basins), Land use, Vegetation, Altitude, Depth, Fish, Water utilization, Color.

Identifiers: *Berkshire County (Mass), *Franklin County (Mass), Inventory.

This is an inventory of the physical, biological and land-water use characteristics of all ponds, lakes, and reservoirs over 5 acres or identified on U.S. Geological Survey topographic maps of Berkshire and Franklin Counties, Massachusetts. Data from published sources or from official files of federal, state and regional water resources agencies were summarized, recorded on standard forms, coded, and keypunched on automatic data processing cards. The physical characteristics of the ponds were updated to include all standing bodies of water over 5 acres located on aerial photographs taken in the spring of 1965. The data should provide a useful guide for public officials who must make decisions on the most prudent use of water and associated land resources. It should also assist agencies and individuals proposing to undertake special studies or research on the state's water resources. (Woodard-USGS)
W73-04069

HYDROLOGIC ASPECTS OF FRESHENING UPPER OLD TAMPA BAY, FLORIDA,
Geological Survey, Tallahassee, Fla.

J. A. Mann.
Florida Bureau of Geology Information Circular No 76, 1972. 39 p, 15 fig, 2 tab, 22 ref.

Descriptors: *Artificial lakes, *Pre-impoundment, *Baseline studies, *Hydrologic aspects, *Florida, Bays, Desalination, Dams, Freshwater, Inflow, Streamflow, Water quality, Groundwater recharge, Aquifer characteristics, Hydrologic data, Data collections, Hydrology, Salinity, Engineering structures, Hydrologic structures, Planning.
Identifiers: *Tampa Bay (Fla), Freshening techniques.

Upper Old Tampa Bay, a 17-square mile area of Old Tampa Bay, Florida, has been proposed for conversion to a fresh-water lake. The amount of runoff to the proposed lake and its chemical quality are both adequate to freshen and sustain a fresh-water lake in this part of the bay. During 1950-66 runoff to the proposed lake, including discharge from Lake Tarpon, would have averaged 134 mgd and would have displaced the volume of the proposed lake at normal pool stage

WATER CYCLE—Field 02

Lakes—Group 2H

(2.5 feet above mean sea level) about 1.7 times per year. Without discharge from Lake Tarpon, the volume of the proposed lake would have been displaced 1.2 times. If the lake level was initially at a normal pool stage during a critically dry year, such as 1956, the proposed lake would have declined 0.25 to 0.5 foot below the minimum design level (1.5 feet above mean sea level). Freshening of the proposed lake to a chloride concentration of 250 mg/liter would require about 4 years. Damming and maintaining the lake at a normal pool stage of 2.5 feet above mean sea level would cause a rise in fresh-water levels in both the water-table aquifer and the upper part of the Floridian aquifer, thereby eventually flushing saline water from both aquifers. (Woodard-USGS)
W73-04094

BATHYMETRIC RECONNAISSANCE OF MARLETTE AND SPOONER LAKES, WASHOE COUNTY AND CARSON CITY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 07C.
W73-04100

WAVE CLIMATE STUDY: GREAT LAKES AND GULF OF ST. LAWRENCE—VOLUME II, APPENDICES A, B, AND C.

National Research Council of Canada, Ottawa (Ontario).

G. W. T. Ashe, and J. Ploeg.

Available from NTIS, Springfield, Va 22151 as AD-72A 172 - Price \$3.00 paper copy; \$0.95 cents microfiche. National Research Council of Canada, Division of Mechanical Engineering Report, March 1971, 253 p.

Descriptors: "Waves (Water)," "Wavelengths," "Height," "Great Lakes, Data collections, Remote sensing, Telemetry, Instrumentation, Fluctuations, Frequency, Curves, Graphical analysis, Statistical methods, Water level fluctuations.

Identifiers: *Gulf of St. Lawrence.

The accelerometer type wave recorder, used for the Wave Climate Study of the Great Lakes and the Gulf of St. Lawrence was originally designed by the Bedford Institute of Oceanography. Several modifications were implemented to the accelerometer during the course of the survey. Appendix A shows the final wave recording system and includes the basic wiring diagrams. Appendix B contains a pictorial presentation of the two wave parameters of main interest, the significant wave height and the wave length, corresponding to the period of the spectral peak. The results of a statistical analysis of the wave records, as presented in Appendix C, should be handled with great caution. The frequency curves of significant wave heights and peak periods have been calculated for a relatively short period of time. They are only given as a qualitative indication of the differences in the wave climate of the Great Lakes area and the Gulf of St. Lawrence. Appendix C also contains a number of samples of acceleration and displacement spectra. (Woodard-USGS)
W73-04103

BUFFALO LAKE RECREATIONAL WATER QUALITY: A STUDY IN BACTERIOLOGICAL DATA INTERPRETATION,
National Environmental Research Center, Cincinnati, Ohio.
For primary bibliographic entry see Field 05B.
W73-04162

STUDIES ON CHEMICAL, PHYSICAL AND BIOLOGICAL CONDITIONS IN SWEDISH ROCKPOOL ECOSYSTEMS,
Stockholm Univ. (Sweden). Asko Lab.
B. Ganning.

Ophelia. Vol 9, No 1, p 51-105. 1971. Illus.

Identifiers: *Ecosystems, Enteromorpha-Intestinalis, Gammarus-Duebeni, Heterocypria-Salinus, Hyadesia-Fusca, Nais-Ellinguis, Nitocra-Spinipes, Physical, *Rockpools, *Sweden, Aquatic animals.

It has been found convenient to recognize 5 main types of rockpools: permanent salt-water pools, ephemeral salt-water pools, brackish-water pools, permanent freshwater pools and ephemeral freshwater pools. The physical and chemical conditions of the rockpools are very variable. Salinity, temperature, O₂ and pH have been considered in this investigation. These parameters are not only regulated by the ambient conditions of the climate and the sea water, but also by such biological conditions as population density and algal growth, which particularly control O₂ and pH conditions. The salinity has formerly been considered to be the main regulating parameter in rockpools, but along the Baltic coast salinity fluctuations are mostly moderate in large and medium-sized pools. In these pools the temperature is considered to be greatest importance for the rockpool organisms; diel fluctuations of 10 deg C, annual extremes of 35 deg C and below 0 deg C and ice may occur. The O₂ and pH variations are often large. Diel amplitudes of 300% O₂ saturation and 2 pH units, from pH 8 to pH 10, are commonly recorded. These environmental conditions give significant faunistic features, individual for each pool. Only few, very tolerant organisms occur in the pools. Among the algae, Enteromorpha intestinalis is dominant in many types of pools. It serves both as shelter, substratum and food for many rockpool organisms. These permanent members of the rockpool ecosystems and a few occasional guests like chironomid larvae, and a few other migrating species from the nearby littoral zone constitute the food webs of the pools. These are short and simple due to the low number of carnivores. The diversity index is reduced in rockpools due to, e.g., the severe abiotic conditions and a strong interspecific competition caused by the restricted number of niches available. Besides, the rockpool ecosystems are young, never growing very old. The land elevation changes the rockpool communities towards a terrestrial climax community. This fact tends to support the low species diversity of the rockpool ecosystems. The rockpool organisms are well adapted to the variable conditions. A high biotic potential and environmental resistance, promote occurrence of rockpool organisms in their characteristic environment.—Copyright 1972, Biological Abstracts, Inc.
W73-04191

BATHYMETRIC RECONNAISSANCE OF TOPAZ LAKE, NEVADA AND CALIFORNIA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 07C.
W73-04192

WIND-INDUCED AND THERMALLY INDUCED CURRENTS IN THE GREAT LAKES,
Wisconsin Univ., Green Bay. Coll. of Environmental Sciences.
K. K. Lee.
Water Resources Research, Vol 8, No 6, p 1444-1455, December 1972. 6 fig, 16 ref.

Descriptors: "Mathematical models," "Thermal stratification," "Water circulation," "Great Lakes, Heat transfer, Currents (Water), Water temperature, Density, Winds, Waves (Water), Boundary layers, Boundary processes.

A linearized stratified lake of rectangular shape with dimensions and other physical parameters comparable to those of the Great Lakes was modeled to examine the currents induced by wind and thermal conditions at the boundary. The boundary layer of thickness was studied at the surface and the solid boundary, where the wind and wall effects are most important. The influence of ther-

mal input is small in the interior. Upwelling and downwelling phenomena, and a relatively strong coastal current are significant in the linear stratified lake. Their relations to the input functions established in the analysis substantiate observations in the Great Lakes. (Knapp-USGS)
W73-04208

BATHYMETRIC RECONNAISSANCE OF RYE PATCH RESERVOIR AND THE PIT-TAYLOR RESERVOIRS, PERSHING COUNTY, NEVADA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 07C.
W73-04227

CHANGES OF VASCULAR AQUATIC FLOWERING PLANTS DURING 70 YEARS IN PUT-IN-BAY HARBOR, LAKE ERIE, OHIO,
Ohio State Univ., Columbus. Coll. of Biological Sciences.
For primary bibliographic entry see Field 05C.
W73-04258

RADIOLOGICAL PHYSICS DIVISION ANNUAL REPORT. ENVIRONMENTAL RESEARCH,
JAN.-DEC. 1971,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05A.
W73-04303

DETERMINATION OF SELECTED TRACE ELEMENTS IN NATURAL WATER SAMPLES USING SPARK SOURCE MASS SPECTROSCOPY,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05A.
W73-04304

ENVIRONMENTAL CHEMISTRY: GRAND RIVER STUDIES,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05B.
W73-04305

RADIONOCLIDES IN LAKE MICHIGAN FISH,
Argonne National Lab., Ill.
For primary bibliographic entry see Field 05A.
W73-04306

STUDIES OF THE NATURAL ALPHA-Emitting Radioisotopes in Marine Organisms,
Washington Univ., Seattle. Lab of Radiation Ecology.
For primary bibliographic entry see Field 05B.
W73-04320

MATHEMATICAL MODEL OF THE ECOLOGICAL SYSTEM OF LAKE DRIVYATY, (IN RUSSIAN),
Akademiya Nauk SSSR, Leningrad. Institut Evoliutsionnoi Fiziologii i Biokhimi.
For primary bibliographic entry see Field 05C.
W73-04321

BEFORE AND AFTER STUDIES ON THE EFFECTS OF A POWER PLANT INSTALLATION ON LAKE LB - A NUMERICAL TEMPERATURE MODEL FOR LAKE LB,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 05B.
W73-04335

BEFORE AND AFTER STUDIES OF THE EFFECTS OF A POWER PLANT INSTALLATION ON LAKE LB - MEASUREMENT AND PRE-

Field 02—WATER CYCLE

Group 2H—Lakes

DICTION OF ABNORMAL RESERVOIR OPERATIONS ON LAKE LBJS WATER QUALITY,
Texas Univ., Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 05B.
W73-04336

DEPOSITIONAL PATTERNS, FACIES, AND TRACE ELEMENT ACCUMULATION IN THE WAUKEGAN MEMBER OF THE LATE PLEISTOCENE LAKE MICHIGAN FORMATION IN SOUTHERN LAKE MICHIGAN,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 02J.
W73-04361

THE LIMNOLOGY AND FISHES OF OLIGOTROPHIC GLACIAL LAKES IN NORTH AMERICA (ABOUT 1800 A.D.),
Department of Lands and Forests, Thunder Bay (Ontario). Research Branch.
For primary bibliographic entry see Field 05C.
W73-04401

LIMNOLOGY AND FISH ECOLOGY OF SOCKEYE SALMON NURSERY LAKES OF THE WORLD,
Bureau of Sport Fisheries and Wildlife, Sandusky, Ohio. Biological Station.
For primary bibliographic entry see Field 05C.
W73-04405

LOCH LOMOND: MAN'S EFFECTS ON THE SALMONID COMMUNITY,
Nature Conservancy, Edinburgh (Scotland).
For primary bibliographic entry see Field 05C.
W73-04407

ASSAULT ON A LAKE,
For primary bibliographic entry see Field 05C.
W73-04442

NITROGEN AND PHOSPHORUS DYNAMICS IN THREE CENTRAL TEXAS IMPOUNDMENTS,
Southwest Texas State Univ., San Marcos. Dept. of Biology.
For primary bibliographic entry see Field 05C.
W73-04484

PHOSPHORESCENT VIRRIOS IN RESERVOIRS OF TURKMENIA, (IN RUSSIAN),
For primary bibliographic entry see Field 05C.
W73-04489

THE PHYSICOCHEMICAL LIMNOLOGY OF A STRETCH OF THE GUADALUPE RIVER, TEXAS, WITH FIVE MAIN-STREAM IMPOUNDMENTS,
Southwest Texas State Univ., San Marcos. Aquatic Station.
W. C. Young, H. H. Hannan, and J. W. Tatum.
Hydrobiologia, Vol 40, No 3, p 297-319, October 30, 1972. 15 fig, 33 ref.

Descriptors: *Water chemistry, *Reservoirs, *Limnology, Texas, Reaceration, Water pollution effects, Dissolved oxygen, Chlorophyll, Hydrogen ion concentration, Alkalinity, Specific conductivity, Water temperature, Turbidity, Streamflow, Water quality.
Identifiers: *Guadalupe River (Tex).

A study of limnological conditions was conducted on a 168-km stretch of the Guadalupe River in central Texas for one year beginning in February, 1969. This river stretch contains five shallow, non-stratified, main-stream reservoirs. Flow through the study area was controlled by releases from

these five reservoirs and from Canyon Reservoir, a deep-storage reservoir, located 30 km upstream. Seasonal and diel changes in limnological conditions were of greater magnitude in impoundments than in lotic areas. Periods of low flow and low velocity resulting in long water retention periods in impoundments, coupled with greater solar input associated with long days, contributed to the greatest fluctuations. Increased discharge, particularly from Canyon Reservoir, caused more uniformity of conditions throughout the study area so that conditions at all points approached average seasonal conditions. High dissolved oxygen in impoundments was accompanied by high chlorophyll a, high pH, and low bicarbonate alkalinity. These conditions indicate the importance of bicarbonate ions as a carbon source for phytoplankton in this system. (Knapp-USGS)
W73-04505

ICE ANALYSES, DATA FROM THREE NORWEGIAN LAKES,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 02C.
W73-04506

A HYDROLOGIC DESCRIPTION OF LAKE MAGDALENE NEAR TAMPA, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 07C.
W73-04537

PRODUCTION OF MASS FORMS OF PLANKTONIC CRUSTACEANS IN LAKE ILMEN (IN RUSSIAN),
Gosudarstvenny Nauchno-Issledovatel'skii Institut Ozernogo i Rechnogo Khozyaistva, Leningrad (USSR).
L. A. Stepanova.
Gidrobiol Zh, Vol 7, No 6, p 19-30, 1971, Illus. English summary.
Identifiers: *Crustaceans, *Lake Ilmen, Mass, *Plankton, Planktonic production, USSR. Zooplankton.

Production values of zooplankton dominating forms in Lake Ilmen were calculated by 2 methods; first on the basis of data on size-age composition of a population and on growth rate by stages and second by the reproduction rate, i.e., by the ratio of egg number in a population per female to the duration of embryonic development. The values for vegetative period production obtained by both methods were similar. Production of filtrators amounted to 10.27 g/m³, that of predatory zooplankters was 9.27 g/m³. By approximate calculations total production of zooplankton was equal to 2.13 g/m³.—Copyright 1972, Biological Abstracts, Inc.
W73-04548

2I. Water in Plants

METHOD FOR THE DIRECT MEASUREMENT OF ABSOLUTE WATER CONSUMPTION OF WOODY PLANTS (IN GERMAN),
Freiburg Univ. (West Germany). Institut fuer Biologische Holzforschung.
H. J. Braun, and P. Schmidt.
Z Pflanzenphysiol, Vol 66, No 4, p 337-342, 1972, Illus. English summary.
Identifiers: Direct measurement, *Potometer, Soils, Ventilation, *Water consumption, *Woody plants.

A method is described which makes it possible to measure immediately and exactly the water-consumption of trees growing in a special potometer with soil ventilation.—Copyright 1972, Biological Abstracts, Inc.
W73-04177

STOMATAL CONDUCTANCE OF DIFFERENTIALLY SALINIZED PLANTS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 03C.
W73-04181

GROWTH FORM AND WATER RELATIONS OF MOSESSES IN THE MARITIME ANTARCTIC,
Aberdeen Univ. (Scotland). Dept. of Botany.
For primary bibliographic entry see Field 02C.
W73-04259

OUR MANGROVES THREATENED,
E. J. Moll, C. J. Ward, T. D. Steinke, and K. H. Cooper.
Afr Wild Life. Vol 25, No 3, p 103-107. 1971. Illus. Map.
Identifiers: Avicennia-marina-D, Bruguiera-gymnorhiza-D, Ceriops-tagal-D, *Conservation, Luminitza-racemosa-D, *Mangroves-D, Rhizophora-mucronata-D, *South Africa.

This unique type of habitat with its equally unique fauna and flora only occurs on the east coast of the Republic of South Africa and in some areas around the larger cities it has been almost completely destroyed. These mangroves are important for the conservation of the estuaries which are needed during the life cycles of many marine organisms. The 5 spp. of mangroves in South Africa are white mangrove, Avicennia marina, black mangrove, Bruguiera gymnorhiza, red mangrove, Rhizophora mucronata, Luminitza racemosa and Ceriops tagal.—Copyright 1972, Biological Abstracts, Inc.
W73-04263

VEGETATION OF THE MESTERS VIG DISTRICT, NORTHEAST GREENLAND: GENERAL SUMMARY AND DISCUSSION,
M. Raup.
Medd Gronland. Vol 194, No 3, p 4-48. 1971. Illus.
Identifiers: Crust, Dry, Frost, *Greenland, Heath, D, Herbs, Hummock, Meadows, Moss, Organic vegetation, Sedge-M, Soil texture, Tundras, Turf, *Vegetation types, *Soil moisture.

Six generalized types of vegetation in the Mesters Vig district are described: moss-sedge meadow, heath tundra, heath-herb tundra, turf hummock vegetation, organic crust vegetation, and the vegetation of dry sites (ledges, talus, trap and till knolls, kames and emerged delta remnants). Lake and sea shore types are of minor significance in the landscape. The 6 types are analyzed with respect to habitat factors of ground coverage by vascular plants, moisture, and physical disturbance by frost and nonfrost geomorphic processes. Comparisons are made among the proportions of wide, intermediate and narrow tolerances to variations on these factor gradients exhibited by the species that compose the various types. It is proposed that with present knowledge of plant-site relationships the distribution of vascular species and vegetations can be rationalized for the most part in terms of the physical properties of the soil and the moisture supply. A key to the generalized types of vegetation is presented, based primarily on the interrelations of moisture, soil texture, and degree of ground coverage by vascular plants.—Copyright 1972, Biological Abstracts, Inc.
W73-04264

FLOW OF WATER INTO CERAMIC TUBES SIMULATING ROOT SYSTEMS,
Department of Agriculture, Summerland (British Columbia). Research Station.
D. S. Stevenson.
Can J Soil Sci. Vol 52, No 1, p 59-65. 1972. Illus.
Identifiers: *Soil-water-plant relationships, Capillary conductivity, Flow, Interface, *Root systems, Soils, Suction, Tubes.

In model root systems constructed of porous ceramic tubing, accumulated outflow volumes of water from 4 inner tubes, simulating plant roots, surrounded by 12 outer tubes was reduced when spacings narrowed below 2.0 mm in both sandy loam and silt soils. Soil water contents and, simultaneously, capillary conductivity decreased faster at close tube spacings than at wider ones in the order of the decrease at 1.0 mm > at 1.5 mm > at 2.0 mm ± that at 3.0 mm ± that at 6.0 mm. The ratio of outflow from 12 tubes to that from 4, surrounded by the 12, is 3 and constant if all tubes receive water from discrete equal-cylinders of soil. At less than 2.0 mm between tubes, the ratio increased with time to maximum of about 9 and 5 for sandy loam and silt loam, respectively, indicating soil cylinder overlap for the particular suction of 0.9 bar imposed on the tubes. At 2.0 mm spacing or greater, the ratio was relatively constant and reasonably close to 3. Radial flow of water may be quickly restricted at root spacings below some limiting distance that is probably dependent upon the demand potential at the soil-root interface.—Copyright 1972, Biological Abstracts, Inc.

W73-04271

NOTES ON RIVER HABITAT USE BY THE LARGER UNGULATES IN THE KALAHARI GEMSBOEK NATIONAL PARK, PRETORIA UNIV. (SOUTH AFRICA). DEPT. OF ZOOLOGY.

J. DU P. BOTHMA.

Koedoe, 14, p 33-48. 1971.

Identifiers: *Africa, Alcelaphus buselaphus, Antidorcas marsupialis, Connochaetes taurinus, Gemsbok, Habitat, Oryx gazella, Rivers, Taurotragus oryx, *Ungulates.

Of the 5 species of large ungulates occupying the Kalahari Gemsbok National Park, 4 utilized the river-bed habitat and banks to a large extent, as was determined by roadside census counts from Sept. 1970 to May 1971. Springbok, Antidorcas marsupialis, and gemsbok, Oryx gazella, were widely distributed along the Nossob and Auob river habitats. Blue wildebeest, Connochaetes taurinus, congregated into herds at specific localities to utilize the area, but the red hartebeest, Alcelaphus buselaphus, was usually found only in the Nossob area. The blue wildebeest seemed to have completed their southward dispersal in the lower reaches of the Auob area. The 5th large ungulate, the eland, Taurotragus oryx, did not utilize the river habitat very much, preferring to remain in the interior plains.—Copyright 1972, Biological Abstracts, Inc.

W73-04273

RADIOECOLOGY AND ECOPHYSIOLOGY OF DESERT PLANTS AT THE NEVADA TEST SITE, CALIFORNIA UNIV., LOS ANGELES. LAB. OF NUCLEAR MEDICINE AND RADIATION BIOLOGY.

For primary bibliographic entry see Field 05C.
W73-04300

CHARACTERISTICS OF THE SEASONAL GROWTH OF TREES IN THE LIGHT OF DENDROCHRONOLOGICAL AND DENDROCLIMATOLOGICAL STUDIES (IN RUSSIAN), L. A. Kairyukshits, and A. L. Yuodval'kis.

Lesovedenie, 3, p 29-34. 1970. English summary.

Identifiers: Alnus-Glutinosa-D, Alnus-Incana-D,

Ash-D, Aspen-D, Birch-D, *Dendroclimatology,

*Seasonal tree growth, Spruce-G, *Trees.

Tree species differ by growth duration (GD), the rhythm and pace of increment in the course of the entire growing season. In well-developed specimens of *Alnus glutinosa* the GD in height is, on the average, 109 days, that of birch-103 days, of *A. incana*-95 days of aspen-73 days, of spruce-60 days, and of ash-51 days. The GD in diameter is 73 days in ash, and in other tree species is 84-93 days.

The diameter growth in spruce begins almost simultaneously with height growth, whereas in the broad-leaved species it begins 5-15 days later. Diameter growth terminates 5-25 days after the termination of height growth. Height growth duration of evenly illuminated and well-developed trees in May and June is higher, when the average air temperature is high; in June, the rate of height growth depends on the amount of precipitation. Diameter growth depends on precipitation only in July and Aug.; the more precipitation, the more intense is growth and its duration. The existing distribution of trees according to growth and development classes is not constant: with the change in time of growth and development, individual trees pass from class to class. At the age of 20-50 yr, about 30-40% of trees change their development class every 5 yr, out of which 2-5% of trees in natural stands and 5-14% in stands with intermediate cuttings pass according to an ascending development line.—Copyright 1972, Biological Abstracts, Inc.

W73-04344

DETERMINATION OF WATER STRESS OF EUCALYPTS IN THE FIELD,

Centro Sperimentale per l'Agricoltura Forestale, Rome (Italy).

L. Lubrano.

G. Bot Ital. Vol 105, No 3, p 109-124. 1971. Illus.

Identifiers: Chambers, Chloroform, Diffusion, *Eucalypts-D, Eucalyptus dalrympleana D, Eucalyptus viminalis D, *Leaves, Membranes, Nitrogen, Permeability, Pressure, Sap, Stress, *Water stress.

Two methods for determining plant hydration in the field were tested on *Eucalyptus viminalis* and *E. dalrympleana* one-yr-old seedlings. The parameters selected are the physicochemical properties of sap and the diffusion pressure deficit (DPD) of leaves. Before extracting sap, leaves were subjected to 2 different preliminary treatments to improve permeability of cellular membranes: chloroform and liquid N treatments, the latter being chosen it was faster. Sap was obtained by expressing at 272 atm., then filtered and analyzed. DPD was determined by equilibration with vapor. A series of samples was placed in moist chambers with known water potential until equilibrium was attained. DPD corresponded to the water potential of the chamber, with the samples neither gaining nor losing water.—Copyright 1972, Biological Abstracts, Inc.

W73-04485

CONSUMPTION OF OLIGOCHAETE WORMS BY FISH AND INVERTEBRATES, (IN RUSSIAN),

Petrozavodsk State Univ. (USSR).

V. I. Popchenko.

Vopr Ikhtiol, Vol 11, No 1, p 96-102. 1971.

Identifiers: Carp, Chaetogaster, *Fish food, Insects, *Invertebrates, Limnodrilus Hoffmeisteri, Lumbriculus variegatus, Nais, *Oligochaete worms, Perch, Styliaria lacustris, Tubifex-tubifex, Whitefish, Worms.

A study was conducted on the consumption of oligochaete worms by fish (carp, golden shiner, perch, whitefish, etc.) and invertebrates (beetles, dragonflies, fishflies, caddis-flies, etc.) in Karelia, Komi ASSR, Murmansk and Arkhangelsk regions. Stomach contents of the fish and the invertebrates were examined microscopically, since the usual macroscopic examination would lead to an underestimation of the importance of the oligochaetes in their nutrition. The most frequently consumed oligochaetes were *Styliaria lacustris*, various species belonging to the genera *Nais* and *Chaetogaster*, *Limnodrilus Hoffmeisteri*, *Tubifex tubifex*, *Lumbriculus variegatus*, as well as individual representatives of the families Enchytraeidae and Lumbricidae.—Copyright 1972, Biological Abstracts, Inc.

W73-04520

THE SIGNIFICANCE OF THE RIVERS OF THE VOLGA DELTA IN THE SPAWNING OF FISH (IN RUSSIAN),

Kaspiski Nauchno-Issledovatel'skiy Institut Rybnogo Khozyaistva, Astrakhan (USSR).

L. I. Serbov.

Vopr Ikhtiol, Vol 11, No 1, p 156-160. 1971. Illus.

Identifiers: Abramis ballerus, Abramis brama, Aspius aspius, Blanca bjoerkna, Delta, *Fish spawning, Leuciscus idus, Rutulus rutulus, Scardinius erythrophthalmus, Spawning, USSR, *Volga delta, Willow D.

It has been assumed that tributary rivers contribute 1-1.5% of the young fish produced in the Volga delta. The present study was undertaken to provide a more definite understanding of the importance of the spawning places in these rivers, which consist primarily of the roots of the willow trees along the banks. The present observations were conducted from the spring of 1965 to the spring of 1969, and during this time the eggs of 10 spp. of fish were found on the submerged roots of willows: vobla (*Rutilus rutilus caspicus*), golden shiner (*Abramis brama*), rudd (*Sardinus erythrophthalmus*), *Blicca bjoerkna*, *ides* (*Leuciscus idus*), *Aspius aspius*, *Abramis ballerus*, *Vimba vimba*, perch (*Perca fluviatilis*), and *Abramis sapo*. Simulated conditions also showed that following hatching a portion of the larva could exist independently for 15-20 days under river conditions. It has been estimated that the river spawning grounds contribute from 1 to several percent of all the young freshwater and migratory fish in the Volga delta and, thus, alone cannot maintain the normal fish population.—Copyright 1972, Biological Abstracts, Inc.

W73-04522

2J. Erosion and Sedimentation

RECENT SEDIMENTS OF THE CENTRAL CALIFORNIA CONTINENTAL SHELF, PIGEON POINT TO SAND HILLS BLUFFS: PART B. MINERALOGICAL DATA,

California Univ., Berkeley, Coll. of Engineering.

J. Lee, T. Yancey, M. Glogoczowski, and P. Wilde.

Available from NTIS, Springfield, Va 22151 as AD-733 278; Price \$3.00 paper copy; \$0.95 cents microfiche. California University Hydraulic Engineering Laboratory Report HEL 2-31, July 1971. 56 p, 1 fig, 5 ref.

Descriptors: *Sedimentology, *Mineralogy, *Continental shelf, *California, *Particle size, Sands, Rocks, Sampling, Data collections, Analytical techniques, Refractivity, Light, Opacity, Optical properties, Classification, Pacific Ocean, Beaches, Estuaries.

Identifiers: *Heavy fraction minerals, Grains, Mineral identification.

The heavy mineralogy of the sand fraction for 37 offshore, 9 beach and 3 stream samples was determined optically in sediment studies of the central California continental shelf. For each sample the percentage of the more diagnostic transparent minerals is plotted graphically in order of persistence: zircon, garnet, biotite, apatite, plagioclase and epidote, lawsonite, green hornblende, oxy-hornblende, glaucophane, sphene, zoisite, augite, jadeite, hypersthene, enstatite, and tremolite and actinolite. Additional data on accessory transparent minerals, composite grains (rock fragments), and opaque minerals are listed with each graph. Particles with a density greater than 2.95 g/cc were called heavy. Particles with a density equal to or less than 2.95 g/cc were designated light. For each heavy fraction grain amount, individual grains were identified with a Leitz Laborlux polarizing microscope under 28, 80, and 360 power until approximately 100 transparent grains were counted. Opaque grains were identified with oblique reflected light. Alterites were considered unidentifiable altered grains. Unknowns were also

Field 02—WATER CYCLE

Group 2J—Erosion and Sedimentation

considered unidentifiable altered grains. Rock fragments were grains of composite mineral composition. (Woodard-USGS)
W73-03922

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 9-11. COLORADO RIVER BASIN TO PACIFIC SLOPE BASINS IN CALIFORNIA.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-03924

THE PLEISTOCENE MORaine STAGES OF WEST-CENTRAL PERU,
Aberdeen Univ. (Scotland). Dept. of Geography.
For primary bibliographic entry see Field 02C.
W73-03931

THE MORPHOLOGICAL EFFECTS OF SURGES OF THE DONJEK GLACIER, ST ELIAS MOUNTAINS, YUKON TERRITORY, CANADA,
Ottawa Univ. (Ontario). Dept. of Geography.
For primary bibliographic entry see Field 02C.
W73-03934

PERIODIC SURGE ORIGIN OF FOLDED MEDIAL MORAINES ON BERING PIEDMONT GLACIER, ALASKA,
Geological Survey, Tacoma, Wash.
For primary bibliographic entry see Field 02C.
W73-03935

MOVEMENT OF WATER IN GLACIERS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 02C.
W73-03936

CONTRIBUTION TO METHODS OF APPLIED INVESTIGATIONS OF SOIL EROSION ON THE RIGHT BANK OF THE VOLGA IN THE GORKI REGION, (IN RUSSIAN),
A. Terent'ev.
Fiz. Geogr. 4, p 21-24. Moscow, 1970.
Identifiers: Erosion, Gorki region (USSR),
"Gradient maps, Methodology, "Soil erosion,
USSR, "Volga River, River banks.

Gradient maps, with 8 gradations, were compiled for the key areas (on the territories of kolkhozes and sovkhozes) based on topographic maps on the scale 1 : 10,000. The maps were then superimposed on soil maps on the same scale, and the relative size of areas with different gradients was computed for every soil variety. This was followed by calculation of the percentage of areas with the different gradients. Soil varieties undergoing various degrees of sheet erosion to the total area of each category of gradients yields the magnitude of soil cover erosion for each gradient.—Copyright 1972, Biological Abstracts, Inc.
W73-04053

PARTICLE SIZE OF MUDFLOWS ON CARPATHIAN RIVERS IN THE UKRAINE (GRANULOMETRICHESKIY SOSTAV SELEVYKH OTLOZHENIY NA REKAH UKRAINSKIKH KARPAT),
Ukrainskii Nauchno-Issledovatel'skii Gidrometeorologicheskii Institut, Kiev (USSR).
For primary bibliographic entry see Field 02E.
W73-04119

A STUDY OF EROSION RESISTANCE OF SOILS ON THE NORTHERN SLOPES OF TRANS-ILI ALA-TAU AND THE KETMEN RANGE (IN RUSSIAN),
N. S. Popova.

Tr Inst Pochvoved Akad Nauk Kaz SSR. 19, p 198-242, 1970.
Identifiers: *Erosion, *Ketmen Range (USSR), Physicochemical soil properties, Slopes, *Soils, USSR.

A study of the texture, microaggregate composition, plasticity and moisture equivalent of different types of soils resulted in derivation of the basic erosion indexes, i.e., the aggregation, dispersion and erosion indexes, the physicochemical properties. The erosion index varied from 0.65-59. The soils were divided into the following groups: very resistant, moderately resistant, weakly resistant and non-resistant. The erosion resistance of soils was found to diminish from the higher to lower vertical zones and from higher to lower humidity (from mountain chernozems, mountain forest and mountain meadow soils to desert soils and sierozems). The erosion resistance diminished down the profile; among the soil-forming rocks, eluvio-deluvial loams are more resistant to erosion by water than loesses.—Copyright 1972, Biological Abstracts, Inc.
W73-04179

RED SEA DRILLINGS,
Woods Hole Oceanographic Institution, Mass.
D. A. Ross, R. B. Whitmarsh, S. A. Ali, J. E. Bourdreaux, and R. Coleman.
Science, Vol 179, No 4071, p 377-380, January 26, 1973. 3 fig, 11 ref.

Identifiers: *Sampling, *Brines, *Oceanography, *Core drilling, Data collections, Cores, Bottom sediments, Sedimentation, Water chemistry, Geochemistry.
Identifiers: *Red Sea, Evaporites.

Recent drilling in the Red Sea shows that much of the basin is underlain by evaporites of a similar age to that of evaporites found in the Mediterranean Sea. These evaporites and their structural positions indicate that other brine areas are present; several others have been discovered. (Knapp-USGS)
W73-04193

OVERBANK SEDIMENTATION IN THE DELAWARE RIVER VALLEY DURING THE LAST 6000 YEARS,
Southern Illinois Univ., Carbondale. Dept. of Geology.
D. F. Ritter, W. F. Kinsey, III, and M. E. Kauffman.
Science, Vol 179, No 4071, p 374-375, January 26, 1973. 2 tab, 10 ref.

Identifiers: *Flood plains, *Sedimentation, *Deposition (Sediments), Radioactive dating, Stratigraphy, Floods, Silts, Paleohydrology, "Delaware River.
Identifiers: *Overbank sedimentation.

A thick sequence of floodplain sediments has accumulated in the Delaware River valley by the process of overbank deposition. Textures in the sediments indicate that the sequence contains no point-bar deposits and is unbroken by periods of erosion. Fourteen radiocarbon dates show that deposition began at least 6000 years ago and has continued to the present. Because the Delaware River shifts its position laterally at a very slow rate, overbank deposition becomes dominant in the construction of its floodplain. (Knapp-USGS)
W73-04194

PENETRATION OF FREE-FALLING OBJECTS INTO DEEP-SEA SEDIMENTS,
Naval Postgraduate School, Monterey, Calif.
J. W. Carlmark.
Available from NTIS, Springfield, Va 22151, as AD-741 140; Price \$3.00 paper copy; \$0.95 microfiche. M. Sc Thesis, December 1971. 263 p, 14 fig, 10 tab, 83 ref.

Identifiers: *Bottom sediments, *Bearing strength, *Compressibility, *Penetration, Sediment-water interfaces, Sedimentology, Oceanography, Physical properties, Hydrodynamics, Mathematical models, Computer programs, Setting velocity.

A method is presented to predict the penetration of free-falling objects into deep-sea sediments by combining proven empirical theories from the field of soil mechanics with known hydrodynamic phenomena. The impact velocity of the object and the shear strength profile and density of the sediment are assumed to be known. Penetration is calculated using a computer, by equating the work done during penetration to the energy of the object falling onto a modeled deep-sea sediment. The objects were simple geometric shapes ranging in weight from 500 to more than 1,000 pounds. The impact velocities ranged from 0 to 20 feet per second. The method successfully predicts the penetration of objects into weak, saturated, sediments within the accuracy of the state-of-the-art techniques for measuring the mechanical properties of sediments. The impact duration time was relatively constant and independent of object velocity, shape, and weight; this implies that it may be a unique property of the dynamic behavior of a sediment type. (Knapp-USGS)
W73-04195

STABILITY AND THE CONSERVATION OF MASS IN DRAINAGE BASIN EVOLUTION,
University of Western Ontario, London. Dept. of Geography.
For primary bibliographic entry see Field 02A.
W73-04202

QUANTITATIVE CHARACTERIZATION OF CHANNEL NETWORK STRUCTURE,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 08B.
W73-04204

SEASONAL SEDIMENT YIELD PATTERNS OF U.S. RIVERS,
Environment Consultants, Inc, New York.
L. Wilson.
Water Resources Research, Vol 8, No 6, p 1470-1479, December 1972. 5 fig, 1 tab, 19 ref.

Identifiers: *Sediment yield, United States, *Seasonal, *Climatology, Erosion, Rainfall, Runoff, Water yield, Land use, Sediment discharge, Data collections, "Rivers.
Identifiers: *Sedihydrograms.

The sedihydrogram is a double log plot of mean monthly sediment yield against mean monthly water yield. Sediment regimes seen on the sedihydrogram are explained by a model that relates basin hydrology to the dominance of common air masses. Mediterranean and continental climate and erosion regimes are well expressed in U.S. rivers. Mediterranean regimes in the western United States have a dry summer and a wet winter with strong seasonal contrasts between early wet season floods and less turbid flow events later in the wet season. Large sediment yield values may be expected from basins in which seasonal desiccation alternates with heavy rains. Continental regimes in the central and eastern United States have a water yield event in late winter or early spring with a low sediment concentration. Summer storms produce high concentrations and a low water yield. The summer component of the sedihydrogram is dominant in dry regions but minor in humid areas, where vegetation offers effective protection from storms. Basins in eastern humid states have a sedihydrogram typical of arid regions if strip mining or urbanization has had an important effect on the basin hydrology. Most climate regimes show a seasonal shift in the parameters of the sediment transport curve, so that an

WATER CYCLE—Field 02

Erosion and Sedimentation—Group 2J

analysis of seasonally grouped data results in improved equations for relating sediment movement to environmental controls. The prediction of sediment yield requires that separate consideration be given to those factors affecting runoff and those affecting sediment concentration. (Knapp-USGS)
W73-04205

BAGNOLD APPROACH AND BED-FORM DEVELOPMENT.
For primary bibliographic entry see Field 06B.
W73-04217

SEDIMENTATION ON SHELL BANKS IN DELAWARE BAY.
Delaware Univ., Newark. Dept. of Geology.
For primary bibliographic entry see Field 02L.
W73-04226

REGIONAL INVENTORY REPORT—SOUTH ATLANTIC-GULF REGION, PUERTO RICO AND THE VIRGIN ISLANDS.
Corps of Engineers, Atlanta, Ga., South Atlantic Div.
For primary bibliographic entry see Field 06B.
W73-04228

TECHNIQUES FOR THE CHARACTERIZATION OF SUSPENDED SEDIMENT AND SELECTED APPLICATIONS FOR THE ACQUIRED DATA,
Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.
For primary bibliographic entry see Field 05B.
W73-04302

EROSION SEDIMENT PRODUCTION,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
B. J. Barfield, and C. T. Haan.

Proc. available from Office of Research and Engineering Services Publications, College of Eng. Univ. of Kentucky, Lexington 40506. In: Proceedings of Symposium on Urban Rainfall Management Problems, April 17-18, 1972, Kentucky University: Lexington, Kentucky University Technical Report UKY 51-72-CE16, p 73-95, June 1972. 8 fig, 4 tab, 16 ref, append.

Descriptors: "Urban hydrology," Erosion, "Sediment yield," "Impact (Rainfall)," Conferences, Urban runoff, Soil erosion, Urbanization, Construction, Sedimentation.

Identifiers: Urban erosion.

Sediment is the largest single polluter of our waters today in terms of total solids. Of the total solids which enter streams and reservoirs, approximately 50% comes from agricultural areas and 50% comes from urban and construction areas, with the major portion coming from construction areas. The kinetic energy of falling raindrops is the agent primarily responsible for erosion. Kinetic energy of raindrops for a given storm is more than 200 times that of the runoff. Rainfall provides the energy necessary for detachment while the runoff provides the carrier necessary to carry the detached particles away. The amount of gross erosion occurring depends on the eroding power of the rainfall and the erodibility of the soil. The universal loss equation gives erosion as a function of rainfall energy and quantity, soil erodibility, slope and length, cover, and management practice. (Knapp-USGS)
W73-04358

URBAN EROSION—PRACTICAL ALTERNATIVES,
Soil Conservation Service, Ann Arbor, Mich.
For primary bibliographic entry see Field 04D.
W73-04359

THE SEDIMENTS AND SEDIMENTARY PROCESSES OF THE HOLOCENE TIDAL FLAT COMPLEX, DELMARVA PENINSULA, VIRGINIA,
Louisiana State Univ., Baton Rouge. Coastal Studies Inst.
For primary bibliographic entry see Field 02L.
W73-04360

DEPOSITIONAL PATTERNS, FACIES, AND TRACE ELEMENT ACCUMULATION IN THE WAUKEGAN MEMBER OF THE LATE PLEISTOCENE LAKE MICHIGAN FORMATION IN SOUTHERN LAKE MICHIGAN,
Illinois State Geological Survey, Urbana.
J. A. Lineback, and D. L. Gross.
Illinois Geological Survey Environmental Geology Note No 58, December 1972. 25 p, 9 fig, 1 tab, 13 ref, append.

Descriptors: "Sedimentology," Bottom sediments, "Sediment distribution," Trace elements, "Lake Michigan, Facies (Sedimentary), Pleistocene epoch, Data collections, Cores, Cross-sections, Geology, Chemical analysis.

The Waukegan Member of the Lake Michigan Formation consists mainly of dark clayey silt and silty clay. It underlies Lake Michigan in most of the southern lake basin south of the Mid-lake High. The Waukegan is divisible into two major facies—the gray silt facies that lies in the center and along the eastern side of the southern lake basin, and the brown silt facies along the western side of the lake and the Mid-lake High. Radiocarbon dates show the Waukegan to be Holocene (late Pleistocene) in age. The thick belt of Waukegan indicated the rate of sedimentation along the east side of Lake Michigan was higher than along the west. The sediments were contributed by shoreline erosion and by several small rivers that drain southern Michigan. Manmade pollution, indicated by accumulations of certain trace elements, is confined to the topmost sample interval (2 to 3 cm) of the brown silt facies of the Waukegan Member, but it occurs as deep as 15 cm in the gray silt facies. The concentration of some trace elements in the surface of the gray silt facies is also consistently higher than in the brown silt facies. The geographic location of higher trace-element accumulation is geologically controlled, as it occurs in the areas floored by recently deposited fine-grained sediment. (Woodard-USGS)
W73-04361

STATISTICAL PROPERTIES OF MISSOURI RIVER BED FORMS,
Sargent and Lundy, Chicago, Ill.
For primary bibliographic entry see Field 06B.
W73-04365

REPORT OF THE CHIEF OF ENGINEERS TO THE SECRETARY OF THE ARMY ON A STUDY OF STREAMBANK EROSION IN THE UNITED STATES.
For primary bibliographic entry see Field 06E.
W73-04473

USE OF FALLOUT CESIUM-137 AS A TRACER TO DEFINE THE RECENT DELTAIC FACIES OF A RIVER,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
P. Plato, and G. C. Goldman.
Radiation Data and Reports, Vol 13, No 12, p 653-657, December 1972. 2 fig, 5 ref.

Descriptors: "Fallout," Tracers, "Deltas," Sedimentation, "Lake Michigan, Great Lakes, Deposition (Sediments), Cesium, Radioisotopes, Radioactivity techniques, Sediment transport, Path of pollutants, Provenance.
Identifiers: "St. Joseph River (Mich.)."

The extent and location of the deltaic sediments in Lake Michigan deposited by the St. Joseph River were studied using fallout cesium-137 as a tracer. Approximately 185 sediment samples were collected and analyzed for cesium-137 aboard ship during five working days. Contour lines represent the measured concentrations of cesium-137. These measurements offer a rapid and inexpensive method to determine the location and size of deltaic facies. The method enables an investigator to sample a large area of sediment in a relatively short period of time. (Knapp-USGS)
W73-04501

SEDIMENTATION—ANNOTATED BIBLIOGRAPHY OF FOREIGN LITERATURE FOR 1969 AND 1970, SURVEY NO 7.

Available from NTIS, Springfield, Va. 22151 TT 71-5005 Price \$6.00 printed copy; 95 cents microfiche. Israel Program for Scientific Translations, TT 71-5005, 1971. 338 p, 1,000 ref.

Descriptors: "Bibliographies," Abstracts, "Publications," Sedimentation, "Foreign countries, Sedimentology, Sediment transport, Sediment yield, Sedimentation rates, Streamflow, Particle size, Sediment load, Sediment distribution, Documentation, Information retrieval, Reviews, Foreign projects.

This seventh volume of the annotated bibliography on sedimentation contains 1,000 entries covering literature published outside the English-speaking world (but including publications in English from non-English-speaking countries). This volume comprises material published mostly in 1969, and partly in 1970. The entries are arranged alphabetically by author, and a subject index is provided. An additional cumulative subject index covers the preceding six volumes. The literature survey undertaken covered mainly periodicals, but also monographs, individual pamphlets and collected papers. The sources were mainly those available at scientific and technical libraries in Israel, but special subscriptions were entered for a number of additional periodicals. The source languages for this issue are Azerbaijani, Belorussian, Bulgarian, Czech, Dutch, English, French, Georgian, German, Greek, Hebrew, Hungarian, Italian, Japanese, Lithuanian, Polish, Portuguese, Romanian, Russian, Serbo-Croatian, Slovakian, Spanish, Swedish, Turkish, and Ukrainian. Of the Soviet periodicals used, several exist in cover-to-cover English translation. (Woodard-USGS)
W73-04507

STRUCTURE AND DEVELOPMENT OF VALLEYS IN THE DAUGAVA RIVER BASIN (STROYENIYE I RAZVITIYE DOLIN BASSEYNA REKI DAUGAVY),
Latvian State Univ., Riga.
G. Ya. Eberhard.
Izdatel'stvo "Zinatne", Riga, 1972. 132 p.

Descriptors: "Geology," Geomorphology, "Topography," Valleys, "River basins, Slopes, Ravines, Cirques, Karst, Streams, Flood plains, Terraces (Geologic), Surfaces, Erosion, Glaciation, Glaciers, Ice, Geologic time, Profiles, Mapping.
Identifiers: "USSR," "Latvian SSR," "Daugava River," Valley development, "Terrace correlation, Base level, Paleogeography."

This monograph presents the results of geomorphological field investigations in the Daugava River basin in Latvia in 1962-66. The geological and geomorphological structure of valleys in the basin is examined together with the problem of terrace correlation. The proposed classification of valleys is based on operation of various valley-forming agents in late-glacial and postglacial times and on effects of change in base level of erosion. (Josephson-USGS)
W73-04512

Field 02—WATER CYCLE

Group 2J—Erosion and Sedimentation

SUMMARIES OF REPORTS PRESENTED AT THE TWELFTH SCIENTIFIC CONFERENCE ON SHORELINE STUDIES HELD IN LITHUANIA IN SEPTEMBER 1971 (XII NAUCHNAYA KONFERENCIYA PO IZUCHENIYU MORSKIKH BEREgov. 13-21 Sentyabrya 1971 G. PALANGA-NIDA. TEZ ISY DOKLADOV), Akademiya Nauk Litovskoi SSR, Vilnius. Otdel Geografii.

Izdatel'stvo 'Tyargale', Vilnius, Gudelis, V. K., and Zabelina, E. K., editors, 1971. 112 p.

Descriptors: *Shores, *Coasts, *Beaches, *Sediments, *Sedimentation, Deposition (Sediments), Sediment transport, Sediment discharge, Dunes, Sand bars, Sand spits, Shoals, Waves (Water), Currents (Water), Beach erosion, Slope stability, Shore protection, Placer mining, Mineralogy, Conferences.

Identifiers: *USSR, *Lithuania, *Shore processes, Shoreline development, Marine erosion, Longshore currents, Placer deposits.

This monograph contains 74 summaries of reports presented at the Twelfth Scientific Conference on Shoreline Studies held September 13-21, 1971 in the Lithuanian towns of Palanga and Nida. The reports are grouped under four subject headings: (1) general theoretical problems (24 reports); (2) coasts and shorelines of the Baltic Sea (23 reports); (3) coasts and shorelines of the Black and Caspian Seas, Sea of Azov, and other seas of the USSR (22 reports); and (4) coasts and shorelines of foreign lands (5 reports). Among the topics discussed are water waves and wave action; marine erosion and deposition; shore profile development and shoreline evolution; sediment transport by longshore currents; placer deposits; and minor shore forms. (Josefson-USGS)

W73-04514

PALEOMAGNETIC STUDIES OF BOTTOM SEDIMENTS FROM THE INDIAN OCEAN AREA OF THE ANTARCTIC (PALEOMAGNIT-NNYE ISSLEDUVANIYA DANNYKH OTLOZHENIY INDIYSKOGO SEKTORA ANTARKTIKI), Severo-Vostochny Kompleksny Nauchno-Issledovatel'skiy Institut, Magadan (USSR). T. I. Lin'kova, and A. P. Lisitsyn. Akademiya Nauk SSSR Doklady, Vol 199, No 6, p 1409-1412, 1971. 3 fig, 1 tab, 7 ref.

Descriptors: *Oceanography, *Indian Ocean, *Antarctic, *Magnetic studies, *Bottom sediments, Sedimentation rates, Diatomaceous earth, Clays, Icebergs, Cores, Profiles, Bottom sampling, Geologic time.

Identifiers: *USSR, *Paleomagnetism, Remanent magnetization, Polarity epochs, Magnetometers, Ozones, Foraminifera.

Data on the paleomagnetism of bottom sediments in the southern part of the Indian Ocean were based on investigations of 12 cores obtained in 1955-1957 by the Soviet research vessel Ob' along two meridional profiles. Deep-sea sediments examined include glacial marine deposits ice-raftered by icebergs, diatomaceous oozes, foraminiferal oozes, and red deep-sea clays. Assuming that sediment deposition was continuous and that the last normal-polarity epoch lasted 0.7 million years, sedimentation rates for the period ranged from 2.9 mm to 6 mm/1,000 years. (Josefson-USGS)

W73-04516

NEW DATA ON DIATOMS FROM SEDIMENTS OF THE BOREAL TRANSGRESSION IN THE VAGA RIVER BASIN (NOVYYE DANNYE O DIATOMOVYKH VODOROSLYAKH OTLOZHENIY BOREAL'NOY TRANSGRESSII V BASSEYNE R. VAGI), Akademiya Nauk SSSR, Syktyvkar. Institut Geologii. E. I. Loseva.

Akademija Nauk SSSR Doklady, Vol 199, No 5, p 1130-1133, 1971. 1 fig, 7 ref.

Descriptors: *Sedimentation, *Glaciation, *Glaciogenic sediments, *Diatoms, *Geologic time, Dating, Palynology, Stratigraphy, Beds (Stratigraphic), Climates, Water types, Sampling, Correlation analysis.

Identifiers: *USSR, *Vaga River, *Boreal, *Interglacial, *Flora.

Comparison of the rich diatom assemblage (258 forms) from the Vaga River basin in southwest Arkhangelsk Oblast with the interglacial Mikulinovo and Riss-Wurm assemblages of other regions shows that many of the Vaga species are widespread in sediments of the Boreal transgression. About 40% of the Vaga flora occur in Boreal sediments of the Leningrad Oblast and Karelia and in the Eemian sediments of Holland. The assemblage of dominant diatoms from the Vaga River basin is unusual and has little in common with other interglacial floras. Its similarity to the assemblage from recent Norwegian Sea sediments and the presence of a number of thermophilic forms, atypical of present northern seas, attest to the great importance of warm Atlantic waters in the evolution of the Vaga flora. (Josefson-USGS)

W73-04517

FLUVIAL-SEDIMENT DISCHARGE TO THE OCEANS FROM THE CONTERMINOUS UNITED STATES,

Geological Survey, Washington, D.C. W. F. Curtis, J. K. Culbertson, and E. B. Chase. Available Free on application to USGS, Washington, DC 20242. Geological Survey Circular 670, 1973. 17 p, 4 fig, 3 tab, 10 ref.

Descriptors: *Sediment discharge, *Sediment yield, *United States, Surveys, Data collections, International Hydrological Decade, Sedimentation, Suspended load, Sedimentology, Erosion.

Annual fluvial-sediment discharge from the conterminous United States averages 491,449,600 short tons, of which 14,204,000 is discharged to the Atlantic Ocean, 378,179,000 to the Gulf of Mexico, and 99,066,600 to the Pacific Ocean. Data from 27 drainage areas were used to estimate the average annual discharge, yield, and concentration of fluvial sediment. The data may be used to extrapolate part of the total world sediment yield to the marine environment. The project was sponsored by UNESCO as an IHD contribution to the World Water Balance study. (Knapp-USGS)

W73-04526

THE OUTPUT OF A LOWLAND CATCHMENT,

Amsterdam Univ. (Netherlands). For primary bibliographic entry see Field 03B.

W73-04533

THE CLAY MINERALOGY AND SOME PROPERTIES OF BOTTOM SEDIMENTS OF THE ST. LAWRENCE RIVER NEAR KINGSTON, ONTARIO, Queen's Univ., Kingston (Ontario). Dept. of Geography.

G. K. Rutherford.

Canadian Journal of Earth Sciences, Vol 9, No 12, p 1670-1676, December 1972. 1 fig, 6 tab, 12 ref.

Descriptors: *Bottom sediments, *Clay minerals, *St. Lawrence River, Mineralogy, Canada, Silts, Clays, Laboratory tests, Sampling, Provenance.

The bottom sediments along a transect of the St. Lawrence River where it flows out of Lake Ontario were sampled at two depths by scuba divers. The samples were analyzed using soil chemical, physical, and mineralogical methods. The medium to fine silt fraction dominates the nonacid treated samples, while the action of HCl increases the clay content some ten times. Although Ca is the domi-

nant exchange cation, exchangeable Mn is unusually high, reflecting the presence of manganese shales in the watershed. Dissolved Ca is the dominant cation in the sediment waters, but the high Na is probably derived from the Canadian Shield element in the surrounding lithology. Illite and illite-chlorite interstratifications are common, while the absence of montmorillonite, a common constituent of Podsol, is noteworthy. (Knapp-USGS)

W73-04538

2K. Chemical Processes

THE STRUCTURE OF LIQUID WATER,

Delaware Univ., Newark. Dept. of Chemical Engineering.

S. I. Sandler, and J. M. Schultz.

Available from the National Technical Information Service as PB-214 101, \$3.00 in paper copy, \$0.95 in microfiche. Delaware Water Resources Center Research Project Technical Completion Report, June 1972. 11 p, append. OWRR A-020-DEL (1).

Descriptors: X-ray diffraction, *X-ray analysis, *Water structure, *Aqueous solutions, Instrumentation, *Analytical techniques, Water analysis.

A new high-speed x-ray diffractometer has been built which can be used for structural studies of water and aqueous solutions. The novel features of this instrument are that a broad spectrum x-ray source is used, and the diffracted beam is scanned electronically over energy, rather than mechanically over scattering angle. State-of-the-art precision is achieved in the diffraction scan in only 1% of the time required for conventional x-ray analysis.

W73-03903

WATER INFLOW INTO HOLE UA-1, AMCHITKA ISLAND, ALASKA,

Geological Survey, Lakewood, Colo.

For primary bibliographic entry see Field 05A.

W73-03919

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 9-11. COLORADO RIVER BASIN TO PACIFIC SLOPE BASINS IN CALIFORNIA.

Geological Survey, Washington, D.C.

For primary bibliographic entry see Field 07C.

W73-03924

THE CHEMICAL HISTORY OF SOME SPRING WATERS IN CARBONATE ROCKS,

Pennsylvania State Univ., University Park. Dept. of Geochemistry and Mineralogy.

For primary bibliographic entry see Field 05B.

W73-03959

ISOTOPIC EXCHANGE STUDIES OF MICRONUTRIENTS IN SOILS,

Missouri Univ., Columbia.

For primary bibliographic entry see Field 02G.

W73-03963

SOIL HYDRAULIC CONDUCTIVITY AND BULK VOLUME CHANGES DURING CYCLIC CALCIUM-SODIUM EXCHANGE,

California Univ., Berkeley.

L. J. Waldron, and G. K. Constantine.

Soil Science, Vol 110, No 2, p 81-85, August, 1970.

3 fig, 3 tab, 7 ref.

Descriptors: *Soil chemistry, Inorganic compounds, *Soil management, Soil structure, Groundwater, *Hydraulic conductivity, *Sodium, *Calcium, *Ion exchange.

Chemical Processes—Group 2K

Differences in physico-chemical interaction of CaCl₂ and NaCl with six soil types were not suppressed by using concentrated solution of equal ionic strength. In alternating permeation with 0.3 M NaCl₂ and 0.9 M NaCl, whenever NaCl replaced CaCl₂ the hydraulic conductivity in all soil types decreased. When CaCl₂ was reintroduced following NaCl permeation, hydraulic conductivity increased in two of six soils, in each case with decreasing bulk volume. Under the experimental condition, salts apparently exerted their effect on hydraulic conductivity through their influence on aggregate stability. Soil pretreatment with strong NaCl solutions exerts a large irreversible effect on soil permeability. (Skogerboe—Colorado State)
W73-03965

A RAPID METHOD OF MEASUREMENT OF DIFFUSION COEFFICIENTS IN AQUEOUS SOLUTIONS,
Kentucky Univ., Lexington.
R. E. Phillips, and J. H. Ellis.
Soil Science, Vol 110, No 6, p 421-425, December, 1970. 1 fig, 1 tab, 9 ref.

Descriptors: *Diffusion, *Ion transport, *Aqueous solutions, Soil moisture, Water chemistry, Measurement, Laboratory tests.
Identifiers: *Diffusion measurement, Capillary tube.

A capillary-tube method of measuring diffusion coefficients of compounds in aqueous solution is described whereby diffusion coefficients of ions and salts important in soils which are not usually available in the literature can be measured in solution with a mean coefficient of variation of approximately 5.1 percent. The coefficient of variation of diffusion coefficient measurements is larger than with more refined methods; however, the capillary-tube method is simple enough that it can be measured in any research laboratory and requires no specialized instrumentation other than that found in most soil research laboratories. (Skogerboe—Colorado State)
W73-03966

THE CONCENTRATION OF K, CA, AND MG IN THE SATURATION EXTRACT IN RELATION TO EXCHANGEABLE K, CA, AND MG,
Landwirtschaftliche Forschungsanstalt, Buenotheof (Germany).
K. Nemeth, K. Mengel, and H. Grifme.
Soil Science, Vol 109, No 3, p 179-185, March, 1970. 5 fig, 1 tab, 15 ref.

Descriptors: *Soil chemistry, Inorganic compounds, Soil management, *Calcium, *Magnesium, *Potassium, Soil structure.
Identifiers: *Saturated extract.

In 72 soil samples of various texture, the concentration of K, Ca, and Mg in the soil solution was studied in relation to other soil properties. The Ca and Mg concentration increased with increasing quantities of exchangeable Ca and Mg regardless of the soil texture. A correlation between the exchangeable K and the K concentration of the soil solution exists only if the soils are classified according to their content of clay and silt. As the percentage K saturation comprises the intensity and the capacity of K supply as well as the buffer capacity, it should characterize the K availability better than exchangeable K alone. (Skogerboe—Colorado State)
W73-03970

ANION EXCLUSION EFFECTS ON CHLORIDE MOVEMENT IN SOILS,
Kentucky Univ., Lexington.
G. W. Thomas, and A. B. Swoboda.
Soil Science, Vol 110, No 3, p 163-166, September, 1970. 5 fig, 1 tab, 9 ref.

Descriptors: *Soil chemistry, Inorganic compounds, *Chlorides, Cation exchange, *Anion exchange, Leaching, Groundwater, Soil moisture, *Clays, *Ion exchange.
Identifiers: *Anion exclusion, Salt movement, *Houston black clay.

The effect of anion exclusion on the rate of chloride movement through soils was studied. In Houston Black Clay the efficiency of chloride movement relative to total water movement was 137 percent at 0.01 N, 119 percent at 0.1 N, 112 percent at 1.0 N concentration. Results suggest that anion exclusion plays an important part in increasing the movement of salt through soils with high cation-exchange capacities. (Skogerboe—Colorado State)
W73-03973

INFLUENCE OF VARIOUS TREATMENTS ON THE DISSOLUTION OF DICALCINIUM PHOSPHATE IN SOILS,
California Univ., Riverside.
For primary bibliographic entry see Field 05B.
W73-03974

DISSOLUTION OF DICALCIUM PHOSPHATE IN RELATION TO IRON OXIDE CONTENT OF ACID SOILS,
Agricultural Coll., Coimbatore (India).
U. S. Sree Ramulu, and P. F. Pratt.
Soil Science, Vol 109, No 1, p 35-39, January, 1970. 2 fig, 2 tab, 15 ref.

Descriptors: *Soil chemistry, *Inorganic compounds, *Iron oxides, Soil management, Soil science.
Identifiers: *Dissolution, *Dicalcium phosphate.

Incubation studies on the persistence or dissolution of dicalcium phosphate dihydrate (DCPD) in 12 soils were conducted over a period of 18 months. The results showed that the time of dissolution of DCPD in soil samples varied inversely with the free iron oxide content of the samples. In samples low in free iron oxides, the points moved toward lower phosphoric acid potential whereas in samples higher in iron oxides, the points corresponding to the solution compositions moved toward the singular point for octacalcium phosphate-Strengite. (Skogerboe—Colorado State)
W73-03983

CALCULATION OF ELECTRICAL CONDUCTIVITY FROM SOLUTION COMPOSITION DATA AS AN AID TO IN-SITU ESTIMATION OF SOIL SALINITY,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 02G.
W73-03984

THE EFFECT OF ELECTROLYTE COMPOSITION ON HYDRAULIC CONDUCTIVITY OF CERTAIN TEXAS SOILS,
Ahwaz Agricultural Coll., (Iran).
For primary bibliographic entry see Field 02G.
W73-03986

BRUCINE ANALYSIS FOR HIGH NITRATE CONCENTRATIONS,
Arctic Health Research Center, Fairbanks, Alaska.
For primary bibliographic entry see Field 05A.
W73-04000

TRACE-METAL ANALYSIS USING ATOMIC ABSORPTION SPECTROPHOTOMETRY,
New York City Water Quality Control Office.
For primary bibliographic entry see Field 05A.
W73-04043

MERCURY IN THE ENVIRONMENT & TECHNIQUES OF ANALYSIS (XIII. ANALYSETECHNIEKEN VOOR KWIK IN HET MILIEU),
Central Lab. TNO, Delft (Netherlands).
For primary bibliographic entry see Field 05A.
W73-04046

SOURCES OF ERROR AND CONFIRMATION IN THE DETERMINATION OF METHYL MERCURY RADICALS,
Stockholm Univ. (Sweden). Institutionen for Analytisk Kem.
For primary bibliographic entry see Field 05A.
W73-04050

ACTIVATION ANALYSIS OF MERCURY AND OTHER ENVIRONMENTAL POLLUTANTS IN WATER AND AQUATIC ECOSYSTEMS,
Isotopenklinika Laboratori, Stockholm (Sweden).
For primary bibliographic entry see Field 05A.
W73-04051

3 - PROPYL - 5 - HYDROXY - 5 - D - ARABINO - TETRAHYDROXYBUTYL - 3 - THIAZOLIDINE - 2 - THIONE, A SPECIFIC COLORIMETRIC REAGENT FOR THE DETERMINATION OF COPPER IN WATER,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 05A.
W73-04056

IRON AND SILICA IN WATER, ACID AMMONIUM OXALATE, AND DITHIONITE EXTRACTS OF SOME NORTH CAROLINA COASTAL PLAIN SOILS,
Soil Conservation Service, Raleigh, N.C.
For primary bibliographic entry see Field 02G.
W73-04088

SOLUTIONS FOR MISCELLANEOUS DISPLACEMENT OF SOIL WATER WITH TIME-DEPENDENT VELOCITY AND DISPERSION COEFFICIENTS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 02G.
W73-04090

INFLUENCE OF WATER CONTENT ON ELECTRICAL CONDUCTIVITY OF THE SOIL,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
For primary bibliographic entry see Field 02G.
W73-04093

RED SEA DRILLINGS,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 02J.
W73-04193

ESTIMATING SALINITY OF STREAMS IN THE SOUTHWESTERN UNITED STATES,
Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.
For primary bibliographic entry see Field 04A.
W73-04198

PERCHLORATE DETERMINATION BY THERMOMETRIC ENTHALPY TITRATION,
Pennsylvania State Univ., University Park. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04230

Field 02—WATER CYCLE

Group 2K—Chemical Processes

ITTRIMETRIC MICRODETERMINATION OF ZINC WITH EDTA USING 1,5-DIBENZYL-NAPHTHYLTHIOCARBAZONE (HNDZ) AS AN EXTRACTIVE INDICATOR,
Delhi Univ. (India). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04231

INEXPENSIVE MERCURY-SPECIFIC GAS CHROMATOGRAPHIC DETECTOR,
National Environmental Research Center, Cincinnati, Ohio. Analytical Quality Control Lab.
For primary bibliographic entry see Field 05A.
W73-04242

SURVEY OF ANALYTICAL SPECTRAL DATA SOURCES AND RELATED DATA COMPILATION ACTIVITIES,
National Bureau of Standards, Washington, D.C., Office of Standard Reference Data.
For primary bibliographic entry see Field 05A.
W73-04244

A HIGH-SELECTIVE TITRATION METHOD FOR DETERMINING COPPER WITH 2,2'-BICINCHONIC ACID (IN RUSSIAN),
Chuvash State Univ., Cheboksary (USSR).
For primary bibliographic entry see Field 05A.
W73-04248

AN ATOMIC ABSORPTION METHOD FOR CATION MEASUREMENTS IN KJELDAHL DIGESTS OF BIOLOGICAL MATERIALS,
California Univ., Berkeley. Environmental Physiology Lab.
For primary bibliographic entry see Field 05A.
W73-04251

NEW, DIRECTLY DIGITAL AUTOMATIC TITRATION APPARATUS,
Indiana Univ., Bloomington. Dept. of Chemistry.
For primary bibliographic entry see Field 07B.
W73-04252

A METHOD OF COLLECTING PERiphyton IN LENTIC HABITATS WITH PROCEDURES FOR SUBSEQUENT SAMPLE PREPARATION AND QUANTITATIVE ASSESSMENT,
Victoria Univ. (British Columbia).
For primary bibliographic entry see Field 02L.
W73-04270

REDUCTION OF CHROMATE BY ZINC AT CONSTANT PH'S. CHEMISTRY OF CHROMATE TREATMENT (PART 2) (IN JAPANESE),
Tokyo Univ. (Japan). Faculty of Engineering.
For primary bibliographic entry see Field 05D.
W73-04282

NUCLEAR ACTIVATION ANALYSIS OF SE, AS, ZN, CD, AND HG IN ENVIRONMENTAL MATRICES,
National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-04328

ACTIVATION ANALYSIS OF HEAVY METALS IN SURFACE WATERS USING ION EXCHANGE FILTER PAPER AND CYANIDE COMPLEXING,
Gulf General Atomic Co., San Diego, Calif.
For primary bibliographic entry see Field 05A.
W73-04329

THERMAL AND MINERAL SPRINGS IN THE SOUTHERN ROCKY MOUNTAINS OF CANADA,
Department of the Environment, Ottawa (Ontario). Water Management Service.
For primary bibliographic entry see Field 04B.
W73-04363

MINIATURE ON-LINE DIGITAL COMPUTER FOR MULTIPURPOSE APPLICATIONS. APPLICATIONS TO KINETIC ANALYSIS,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
For primary bibliographic entry see Field 07C.
W73-04387

RAMAN SPECTRA-STRUCTURE CORRELATION FOR PYRAZINES. NEW METHOD FOR OBTAINING SPECTRA OF TRAPPED NANOLITER GAS CHROMATOGRAPH FRACTIONS,
Procter and Gamble Co., Cincinnati, Ohio. Miami Valley Labs.
For primary bibliographic entry see Field 05A.
W73-04388

ELECTRONIC SPECTRA OF 2-AMINOQUINOLINE AND 4-AMINOQUINALDINE. EVIDENCE FOR THE CYCLIC AMIDINE STRUCTURE OF THE SINGLY PROTONATED CATIONS,
Florida Univ., Gainesville. Coll. of Pharmacy.
For primary bibliographic entry see Field 05A.
W73-04389

INFLUENCE OF AMALGAM FORMATION ON CYCLIC VOLTAMMETRY,
Michigan State Univ., East Lansing. Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04410

AUTOMATIC SORTING OF INFRARED SPECTRA,
National Biological Standards Lab., Canberra (Australia).
For primary bibliographic entry see Field 07C.
W73-04413

SOME COMMENTS ON THE SIGNAL-TO-NOISE CHARACTERISTICS OF REAL PHOTOMULTIPLIER AND PHOTODIODE DETECTION SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
For primary bibliographic entry see Field 07B.
W73-04419

HIGH SENSITIVITY THERMOCHEMICAL ANALYSIS,
Georgia Univ., Athens. Dept. of Chemistry.
For primary bibliographic entry see Field 07B.
W73-04420

GROUND WATER IN THE PLAQUEMINE-WHITE CASTLE AREA, IBERVILLE PARISH, LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 04B.
W73-04502

THE PHYSICOCHEMICAL LIMNOLOGY OF A STRETCH OF THE GUADALUPE RIVER, TEXAS, WITH FIVE MAIN-STREAM IMPOUNDMENTS,
Southwest Texas State Univ., San Marcos. Aquatic Station.
For primary bibliographic entry see Field 02H.
W73-04505

CHEMICAL COMPOSITION OF ATMOSPHERIC PRECIPITATION IN THE DEPUTATSKIY REGION (KHIMICHESKIY SOSTAV ATMOSFERNYKH OSADOKOV, VYPADAYUSHCHIKH NA TERRITORII DEPUTATSKOGO RAYONA),
Moscow State Univ. (USSR). Kafedra Metallovedeniya.
For primary bibliographic entry see Field 02B.
W73-04511

SOME COORDINATION EFFECTS IN NATURAL WATERS OF ETHIOPIA,
Haile Selassie I Univ., Addis Ababa, (Ethiopia). L. R. Pittwell.
Journal of Hydrology, Vol 17, No 3, p 225-228, November 1972. 5 ref.

Descriptors: "Water chemistry," "Aqueous solutions, Polyelectrolytes, Hydration, Chemical reactions, Trace elements." Identifiers: "Ethiopia."

A few of the consequences of coordination in water chemistry are discussed, especially as they affect trace element contents of the natural waters of Ethiopia. With the possible exception of the alkali metals other than lithium, all metals in aqueous solution are coordinated by some ligand, if only by water itself. Coordination is governed by three things: (1) the Mass Law, (2) the bond strength between ligand and metal, and (3) whether a mechanism exists whereby one ligand may displace another. In the hot springs and pools at Dalol in Ethiopia which are saturated in chlorides, many metals occur as their chlorocomplexes, the most notable being iron which occurs as both chloroferrate II and chloroferrate III. The commonest ligands likely to be found in nature are water itself, carbonate, chloride, fluoride and organic acids. In nature, chloride ion is almost always an important ligand for acidic water, while carbonate ion becomes important in alkaline waters and can keep large amounts of many metals in solution, even calcium, which must be present in highly alkaline lakes such as Lake Baasaka. Carbonate waters are susceptible to vulcanism and plant action. At Koka on the Awash River and also around Lake Shalla, Ethiopia, bicarbonate groundwater seeping into porous rocks and faults comes in contact with hot rocks below, bicarbonate is decomposed to carbonate, and alkaline hot springs are produced which are relatively high in trace metals. Copper is present in practically all the alkaline rivers flowing off the Ethiopian plateau to the Nile, and is also present in the sea. (Knapp-USGS)
W73-04529

A REVIEW OF THE ARSENIC CYCLE IN NATURAL WATERS,
Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.
For primary bibliographic entry see Field 05B.
W73-04541

2L. Estuaries

MODEL STUDIES OF NAVIGATION IMPROVEMENTS, COLUMBIA RIVER ESTUARY: REPORT 2, SECTION 3, FIXED-BED STUDIES OF DISPOSAL AREAS C AND D,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-03915

RECENT SEDIMENTS OF THE CENTRAL CALIFORNIA CONTINENTAL SHELF, PIGEON POINT TO SAND HILLS BLUFFS: PART B. MINERALOGICAL DATA,
California Univ., Berkeley. Coll. of Engineering.
For primary bibliographic entry see Field 02J.
W73-03922

Field 02—WATER CYCLE

Group 2L—Estuaries

LAMPREYS AND TELEOST FISH, OTHER THAN WHITEBAIT, IN THE POLLUTED THAMES ESTUARY, Kings Coll., London (England). Dept. of Zoology. For primary bibliographic entry see Field 05C. W73-04262

OUR MANGROVES THREATENED. For primary bibliographic entry see Field 02I. W73-04263

A METHOD OF COLLECTING PERiphyton IN LENTIC HABITATS WITH PROCEDURES FOR SUBSEQUENT SAMPLE PREPARATION AND QUANTITATIVE ASSESSMENT, Victoria Univ. (British Columbia). S-D. Brown, and A. P. Austin. Int Rev Gesamten Hydrobiol. Vol 56, No 4, p 557-580. 1971. Identifiers: *Analytical techniques, Assessment, Collection, Exposure, Frame, Habitats, Lentic habitats, *Periphyton, Preparation, Procedures, Slides.

The design and construction of a periphyton exposure frame is described. The frame holds large glass microscope slides in either horizontal or vertical position. After placing the loaded frame in position, glass slides are removed approximately once a month to obtain samples. The slides are placed in a formalin solution. The periphyton is carefully removed in a known volume of solution, and aliquots are passed through millipore filters and mounted permanently by use of standard techniques. Organisms are then identified and enumerated. A statistical analysis is made of the results from samples obtained in Elk Lake, British Columbia. The largest variance component was introduced during counting; little error was provided by the filtering or the sampling stages of the analysis.—Copyright 1972, Biological Abstracts, Inc. W73-04270

ECOLOGICAL STUDIES OF RADIOACTIVITY IN THE COLUMBIA RIVER ESTUARY AND ADJACENT PACIFIC OCEAN, PROGRESS REPORT, JULY 1, 1971-JUNE 30, 1972, Oregon State Univ., Corvallis. School of Oceanography. For primary bibliographic entry see Field 05B. W73-04299

CHARACTERIZATION OF THE SEDIMENTS FROM THE TURA AND SABANA RIVER ESTUARIES, Puerto Rico Nuclear Center, Mayaguez. For primary bibliographic entry see Field 05C. W73-04308

STUDIES OF THE NATURAL ALPHA-Emitting RADIONUCLIDES IN MARINE ORGANISMS, Washington Univ., Seattle. Lab of Radiation Ecology. For primary bibliographic entry see Field 05B. W73-04320

SEASONAL CONCENTRATION, TURNOVER, AND MODE OF ACCUMULATION OF P32 BY THE JUVENILE STARRY FLounder IN THE COLUMBIA RIVER ESTUARY, PLATICHTHYS STELLATUS (PALLAS), Oregon State Univ., Corvallis. For primary bibliographic entry see Field 05C. W73-04322

THE SEDIMENTS AND SEDIMENTARY PROCESSES OF THE HOLOCENE TIDAL FLAT COMPLEX, DELMARVA PENINSULA, VIRGINIA, Louisiana State Univ., Baton Rouge. Coastal Studies Inst.

S. C. Harrison.

Available from NTIS, Springfield, Va 22151 as AD-745-754 Price \$3.00 printed copy; 95 cents microfiche. Technical Report No 112, April 1972. 107 p, 62 fig, 9 tab, 103 ref. NR 388 002. ONR N00014-69-A-0211-0003.

Descriptors: *Sedimentation, *Tidal waters, *Virginia, *Sedimentology, Sediment transport, Estuaries, Tidal effects, Sampling, Particle size, Environmental effects, Sediment distribution, Bottom sediments, Geology, Tidal marshes, Salinity. Identifiers: *Delmarva Peninsula (Va).

The sediment accumulating in the modern transgressing (up to 10 m/yr) intertidal complex of the Northern Virginia Coast is primarily mud. Most of the inorganic sediment (silts, sands, and clays) is derived from erosion of old marsh on the seaward side of the eroding coast. It enters the estuarine complex as individual grains or as agglomerates bound together with organic detritus. An abundant and diverse fauna ingests many of the particles, producing feces as byproducts of the metabolic processes. Up to 50% of the sediment is composed of soft sand- and coarse silt-sized fecal pellets, which significantly alter the textural character of the deposit. The upper 15 cm of the deposit indicate that continual agitation of the bottom by currents has reworked the heavier fecal pellets into laminations and cross beds alternating with sand- or silt-sized mineral layers. These laminations directly affect acoustical properties and soil strength. Lighter pellets and other organic-inorganic agglomerates either accumulate on grasses in the marshes or form larger agglomerates which are deposited in bays or protected tidal flats. Concentration of organic fines in suspension enhances spread of contaminants through absorption by the suspended material. (Woodard-USGS) W73-04360

NONUNIFORM GROUNDWATER-CONDUIT DISCHARGE AND HEAD LOSS, University of Southern California, Los Angeles. Dept. of Civil Engineering. For primary bibliographic entry see Field 02F. W73-04362

COASTAL CURRENTS OF PACIFIC NORTHWEST, Utah Univ., Salt Lake City. Dept. of Civil Engineering. For primary bibliographic entry see Field 05B. W73-04364

TYBEE ISLAND, GEORGIA; GALVESTON BAY, TEXAS. For primary bibliographic entry see Field 06E. W73-04452

RIVER BASIN MONETARY AUTHORIZATIONS-1969, CHESAPEAKE BAY BASIN IN COMPREHENSIVE STUDY. For primary bibliographic entry see Field 06E. W73-04454

LAW OF THE SEA. For primary bibliographic entry see Field 06E. W73-04465

A METHOD FOR MINIMIZING EFFECTS OF WASTE HEAT DISCHARGES, Baltimore Gas and Electric Co., Md. For primary bibliographic entry see Field 05G. W73-04481

03. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

CONQUEST OF WASTES SHOW PRODUCTIVITY. For primary bibliographic entry see Field 03F. W73-03979

METHOD AND APPARATUS FOR SOFTENING OR DESALTING WATER BY ION EXCHANGE, GHII-MAN Technik Gesellschaft fuer Anlagenbau m.b.H., Essen (West Germany).

G. K. Kunz. U.S. Patent No 3,679,581, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 90, No 4, p 1491, July 25, 1972.

Descriptors: *Patents, *Water softening, *Water treatment, *Desalination, *Ion exchange, Anion exchange, Cation exchange, Potable water.

Raw water is fed in a countercurrent relationship through alternate zones of cation exchange and anion exchange material. The spent cation and anion exchange material are continuously withdrawn and regenerated before being sent for reuse. A washing column is connected to each regenerating column and to the exchange column so that after the regeneration and washing of the exchange material each will be returned to its respective zone. The exchange column is provided with inserted bottom portions which are permeable for the water but not for the exchange material. Pure water is continuously drawn off from the contacting area. (Sinha-OEIS) W73-04133

REVERSE OSMOSIS WATER PURIFIER, Polymetrics, Inc., San Carlos, Calif. (assignee). T. M. Clark, H. Shanfield, and D. L. Grunau. U.S. Patent No 3,679,055, 4 p, 5 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 90, No 4, p 1372, July 25, 1972.

Descriptors: *Patents, Equipment, *Reverse osmosis, *Membranes, *Water purification, *Water treatment, Separation techniques.

This apparatus comprises an airtight tank forming a reservoir capable of retaining air under pressure. It has a membrane for separating purified water from the supplied water by reverse osmosis. As purified water is collected it compresses air in the tank. The air is used to force the purified water through the conduit supplying water to the element is responsive to the air pressure within the storage tank to cut off the water flow when the supply of purified water reaches a predetermined level. (Sinha-OEIS) W73-04135

COMBINED STREAM POWER PLANT AND WATER DISTILLATION SYSTEM, General Electric Co., Schenectady, N.Y. (assignee). D. H. Brown. U.S. Patent No 3,677,905, 3 p, 9 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 90, No 3, p 1071, July 18, 1972.

Descriptors: *Patents, Multiple purpose projects, Dual purpose, *Power plants, *Distillation, Water treatment, Water purification, Water quality, Equipment, *Condensation, Steam, *Steam turbines, *Waste water treatment.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Use of Water of Impaired Quality—Group 3C

A steam power-distillation system is described in which the distillation apparatus is located between the first and last turbine stages. The distillation apparatus removes steam from the preceding turbine at the highest possible temperature. The steam remaining after the last stage of distillation is not condensed but is sent through a low pressure steam turbine where it is used to produce power. (Sinha-OEIS)
W73-04140

METHOD AND APPARATUS FOR WATER SOFTENING,
Ecdyne Corp., Chicago, Ill. (assignee).
D. M. O'Brien, and C. R. Miller.
U. S. Patent No 3,676,336, 7 p, 3 fig, 2 tab, 3 ref; Official Gazette of the United States Patent Office, Vol 900, No 2, p 676, July 11, 1972.

Descriptors: *Patents, Equipment, Treatment, *Water softening, *Desalination, *Water treatment, Ion exchange, *Resins, Cation exchange, Anion exchange, Water quality control.

A method and apparatus are described for providing regenerated resin to an ion-exchange column. The conductivity of the water is multiplied by the flow and when it reaches a predetermined total, there is an indication that regenerated resin is needed. The ion exchange resin is a mixed bed of anion and cation exchange resins and the invention comprises an improved control system. (Sinha-OEIS)
W73-04145

REVERSE OSMOSIS FOR WASTE WATER TREATMENT: WHAT, WHEN,
Aqua-Chem, Inc., Waukesha, Wis.
For primary bibliographic entry see Field 05D.
W73-04187

LEARNING, EXTERNAL BENEFITS, AND SUBSIDIES IN WATER DESALINATION,
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 06B.
W73-04274

AUSTRALIAN SIROTHERM PROCESS REMOVES SALT FROM BRACKISH WATER,
For primary bibliographic entry see Field 05F.
W73-04285

REVERSE OSMOSIS FOR WASTEWATER TREATMENT,
Ontario Research Foundation, Toronto.
For primary bibliographic entry see Field 05D.
W73-04487

REVERSE OSMOSIS CAN CUT COST OF WATER TREATMENT,
Gulf General Atomic, Inc., San Diego, Calif.
For primary bibliographic entry see Field 05D.
W73-04549

3B. Water Yield Improvement

DEVELOPMENT OF ECONOMIC WATER HARVEST SYSTEMS FOR INCREASING WATER SUPPLY - PHASE II,
Arizona Water Resources Research Center, Tucson.
C. B. Cluff, G. R. Dutt, P. R. Ogden, and J. K. Kuykendall.

Available from the National Technical Information Service as PB-214 128, \$4.50 in paper copy, \$0.95 in microfiche. OWRR Completion Report, July, 1972. 57 p, 16 fig, 8 tab, 11 ref. OWRR B-015-ARIZ. (3) 14-01-0001-1425.

Descriptors: *Water harvesting, *Water yield improvement, *Water conservation, Rainfall-runoff relationships, Seepage control, Evaporation control, *Rain water.
Identifiers: *Gravel covered plastic, *Sodium treated catchments, Covered storage tanks, Asphalt catchments.

Four different catchment systems for the harvesting of rain water were studied. These were the Graveled Plastic, Compacted Earth (CE), Compacted Earth Sodium Treated (CEST) and the Asphalt-Plastic-Asphalt-Chip coated (APAC) catchments. Installation methods were developed to reduce costs particularly with regard to the Graveled Plastic, CE and CEST catchments. The rock filled, suspended and raft covered tank methods were utilized with the above catchments to form economic water harvesting systems. The different conditions where the above water harvesting systems were to be used were delineated. Considerable effort was expended in the development of a multipurpose water harvesting system. This system was designed to grow horticultural deep-rooted crops and produce water. An acre CEST catchment with a raft covered sodium treated reservoir was used to demonstrate this system. Some of the water was utilized by grapes planted in the drainage channels with the excess water going into storage. (See also W72-09060)
W73-03901

HYDROLOGIC REGIMEN OF LOWER TONTO CREEK BASIN, GILA COUNTY, ARIZONA—A RECONNAISSANCE STUDY,
Geological Survey, Phoenix, Ariz.
H. H. Schumann, and B. W. Thomsen.
Arizona Water Commission Bulletin 3, November 1972. 39 p, 14 fig, 1 tab, 19 ref.

Descriptors: *Hydrology, *River basins, *Arizona, Water resources, Water yield, Water quality, Rainfall-runoff relationships, Hydrogeology, Surface waters, Groundwater, Aquifers, Water wells, Water utilization, Geology, Streamflow, Lakes, Water balance, Hydrologic budget.
Identifiers: *Tonto Creek basin (Ariz.).

The increasing demand for municipal, industrial, and irrigation water in the Salt River Valley in southern Arizona has created a need for an appraisal of the water resources of the watersheds above the storage reservoirs on the Salt River. The U.S. Geological Survey in cooperation with the Salt River Valley Water Users' Association conducted a hydrologic reconnaissance study in the lower Tonto Creek basin in the western part of Gila County, Ariz., to obtain water-resources information for use in making water-management decisions. In the 280-square-mile lower Tonto Creek basin the principal sources of water are precipitation, which ranges from 17 to more than 20 inches per year, and the streamflow that enters the area from the upper Tonto Creek basin. The precipitation that falls on the lower basin produces about 20,000 acre-feet per year of streamflow. The streamflow that enters the lower basin from the 675-square-mile upper basin is measured at the northern end of the study area and averages about 80,000 acre-feet per year. An estimated 17,000 to 20,000 acre-feet of streamflow infiltrates annually into the highly permeable alluvium. Flow in Tonto Creek and groundwater in the alluvium and the lower part of the basin fill are of excellent chemical quality and are suitable for most uses. (Woodard-USGS)
W73-04099

ATMOSPHERIC WATER COLLECTOR,
R. J. Swanson.
U. S. Patent No 3,675,442, 3 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 900, No 2, p 465, July 11, 1972.

Descriptors: *Patents, *Potable water, *Water supply, Equipment, *Water sources, *Atmosphere, Condensation, Freezing.
Identifiers: *Atmospheric moisture.

An apparatus is provided for removing water vapor from atmospheric moisture. The apparatus comprises a container holding a bath of fresh water and a mechanical refrigerator. A conduit having an inlet opening in the container extends through a housing and discharges into the bath. The conduit permits the fresh water in the bath to flow to and from the housing that channels a flow of moisture laden air. Special filaments provide condensing surfaces at a temperature below the dew point of the air in the housing. Potable water is thus obtained from the atmosphere. (Sinha-OEIS)
W73-04149

COMPARISON OF MULTIPLE REGRESSION AND PRINCIPAL COMPONENT REGRESSION FOR PREDICTING WATER YIELDS IN KENTUCKY,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04A.
W73-04199

GROUND WATER RECONNAISSANCE IN THE ARGHANDAB RIVER BASIN NEAR KANDAHAR, AFGHANISTAN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-04379

THE OUTPUT OF A LOWLAND CATCHMENT,
Amsterdam Univ. (Netherlands).
A. C. Imeson, and R. C. Ward.
Journal of Hydrology, Vol 17, No 3, p 145-159, November 1972. 5 fig, 3 tab, 24 ref.

Descriptors: *Rainfall-runoff relationships, *Water yield, *Sediment yield, *Water chemistry, *Small watersheds, Instrumentation, Water balance, Data collections, Land use, Dissolved solids, Suspended load.
Identifiers: *England.

The output of water and materials from a small instrumented catchment in a low, relatively level boulder clay region in eastern England is described. One of the main characteristics of this catchment is the large seasonal variation in the rainfall-runoff relationship. This is the main factor responsible for similar seasonal variations in the output of dissolved, suspended and bedload material. In areas of low relief such seasonal variations are likely to be much greater than in nearby areas of more pronounced relief receiving similar amounts of rainfall. Most of the material leaving the catchment is carried in solution, reflecting natural physical conditions, the agricultural land use, the small output of suspended solids, and the very slow rate of soil erosion. This is also characteristic for lowland areas. (Knapp-USGS)
W73-04533

3C. Use of Water of Impaired Quality

SALINITY PROBLEMS IN ARID LANDS IRRIGATION: A LITERATURE REVIEW AND SELECTED BIBLIOGRAPHY,
Arizona Univ., Tucson. Inst. of Arid Lands Research.
H. E. Casey.

Available from National Technical Information Service as PB-214 172, \$3.00 in paper copy, \$0.95 in microfiche. Arid Lands Resource Information Paper No. 1, WRSIC 73-300, 1972. 300 p. OWRR 14-01-0001-1616.

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3C—Use of Water of Impaired Quality

Descriptors: *Bibliographies, *Salinity, *Salts, *Irrigation water, *Water quality, Arid lands, Salt tolerance, Leaching, Drainage systems, Saline water, Irrigation effects, Irrigation practices, Land reclamation, Watersheds (Basins), Water policy, Colorado River Basin, Mexican Water Treaty, Greenhouses, Return flow, Southwest U.S.

A bibliography of 986 references with accompanying text that reviews broadly such topics as water quality and the total drainage basin, salinity prevention and soil reclamation, salinity and drought effects on plants, soil and water salts, basic water balance problems in relation to irrigation, plus a perspective on historic salinity problems and an overview. Socioeconomic aspects are considered, with reference to the Colorado River basin as an example in microcosm. There is discussion of currently used and potential ameliorative techniques that would render current methods more efficient, raise productivity enough to constitute a breakthrough, and high-humidity low water-use greenhouse structures that would radically alter current arid lands irrigation methods. Recommendations include: (1) standard reclamation practices should be used wherever possible; (2) intensive research and development efforts should be encouraged on crop growing methods constituting major departures from standard irrigation practices, or those that increase crop tolerance to saline waters and soils; (3) national governments should recognize the seriousness of salinity problems and accord them high scientific priority; (4) independent institutes for information-gathering and research direction should be established and supported; and (5) planning construction and large-scale reclamation projects should be suspended or slowed until a more balanced assessment of their viability can be determined.
W73-03910

TRICKLE IRRIGATION....A MORE EFFICIENT MEANS OF WATER MANAGEMENT, Texas A and M Univ., Weslaco, Agricultural Research and Extension Center.

C. G. Lyons, Jr.
Texas Agricultural Progress, Vol 18, No 1, p 3-4, Winter, 1972. 5 fig.

Descriptors: *Irrigation systems, *Application methods, *Water conservation, Irrigation engineering, Water pollution, Groundwater, Crop production, Water management (Applied), Water reuse.

Identifiers: *Trickle irrigation, *Drip irrigation, *Daily flow, Irrigation research.

The sudden increase in the use of trickle irrigation is attributed to the availability of low cost plastic pipe and the shortage of water in some areas. Trickle irrigation is the application of water, on a regular basis, directly to the plants root zone. A trickle system consists of a water source, pump, filter, time clock, pressure regulator, mainline, laterals, and emitters. Costs for the system vary from \$150 to \$500 per acre. Advantages of the method include water and labor savings, increased yield, and ability to use lower quality water. Disadvantages include system malfunction, salt accumulation, disease factors, and cost. (Skogerboe-COLORADO STATE)
W73-03953

STARTING WITH TRICKLE IRRIGATION, Business Dynamics Corp., Phoenix, Ariz. E. D. DeRemer. Reclamation Era, Vol 56, No 4, p 15-17, November, 1970.

Descriptors: *Irrigation systems, *Application methods, *Water conservation, Sprinkler irrigation, Irrigation engineering, Water pollution, Groundwater, Crop production, Lemons, Tomatoes, Melons, Sweet corn, Water reuse.

Identifiers: *Trickle irrigation, *Irrigation research, Peppers, Cucumbers.

Trickle irrigation has been receiving much publicity and attention throughout the world. Several workers, independent of each other, are reporting phenomenal water savings and sizable yield increases. Studies in Israel show yield increases of 50 to 100 percent with trickle irrigation as compared to sprinkler or furrow irrigation for tomatoes, cucumbers, melons, peppers, and sweet corn. Trickle irrigation was used on a 10 acre plot of lemons near Yuma, Arizona, with the following results. Water use was 1/9th, percent; fertilizer use was 20 percent, and yield was more than double. Another benefit of trickle irrigation is that poorer quality water can be used with no apparent damage to the area. (Skogerboe-COLORADO STATE)
W73-03958

STOMATAL CONDUCTANCE OF DIFFERENTIALLY SALINIZED PLANTS,

Wisconsin Univ., Madison, Dept. of Soil Science. M. B. Kirkham, W. R. Gardner, and G. C. Gerloff. Plant Physiol. Vol 49, No 3, p 345-348. 1972. Illus.

Identifiers: *Barley-M, *Bean-D, Conductance, Diffusion, *Hordeum-vulgare-M, Leaves, Nutrients, Osmotic, Phasedus-vulgare-D, Porometer, Roots, *Stomatal conductance, *Salinized plants.

Stomatal resistance was measured daily with a stomatal diffusion porometer during a 4-wk period in leaves of bean (*Phaseolus vulgaris* L. cv. 'Bush Blue Lake') and barley (*Hordeum vulgare* L. cv. 'Liberty') plants having roots equally split between 2 differentially salinized nutrient solutions. The stomatal conductance (reciprocal of stomatal resistance) of plants with half their roots in saline solutions was intermediate between the stomatal conductances of plants grown in nonsaline solutions and those grown in saline solutions. Copyright 1972, Biological Abstracts, Inc.
W73-04181

ESTIMATING SALINITY OF STREAMS IN THE SOUTHWESTERN UNITED STATES,

Agricultural Research Service, Chickasha, Okla. Southern Great Plains Watershed Research Center.

For primary bibliographic entry see Field 04A.
W73-04198

CONFERENCE ON BENEFICIAL USES OF THERMAL DISCHARGES.

For primary bibliographic entry see Field 05G.
W73-04337

WASTE HEAT USE IN CONTROLLED-ENVIRONMENT GREENHOUSES,

Arizona Univ., Tucson.

For primary bibliographic entry see Field 05G.
W73-04345

AN INDEPENDENT VIEW OF THE USE OF THERMAL POWER STATION COOLING WATER TO SUPPLEMENT INTER-REGIONAL WATER SUPPLY,

Battelle-Pacific Northwest Labs., Richland, Wash.

For primary bibliographic entry see Field 05G.
W73-04346

AGRICULTURAL AND URBAN USES OF LOW-TEMPERATURE HEAT,

Oak Ridge National Lab., Tenn.

For primary bibliographic entry see Field 05G.
W73-04349

BENEFICIAL USES OF WASTE HEAT - AN EVALUATION,
Pacific Northwest Water Lab., Corvallis, Ore.
For primary bibliographic entry see Field 05G.
W73-04351

3D. Conservation in Domestic and Municipal Use

REGIONAL DEVELOPMENT OF PUBLIC WATER SUPPLY SYSTEMS,

North Carolina Water Resources Research Inst., Raleigh.

J. M. Higgins, and D. A. Okun. Available from the National Technical Information Service as PB-214 139, \$3.00 in paper copy, \$0.95 in microfiche. North Carolina Water Resources Research Institute, Rept No 72, September 1972, 124p, 26 fig, 8 tab, 56 ref. OWRR A-055-NC (3). 14-31-0001-3533.

Descriptors: *Water supply, *Water distribution, *Optimization, *Regional analysis, *Regional development, *Water utilization, Model studies, Cost analysis, *North Carolina, *Alternative water use, *Alternative costs, Water transfer, Water demand.

Identifiers: *Regional water supply systems.

The purpose was to develop a systematic method for evaluating regional water supply alternatives. Cutoff density and time parameters are developed to identify the break-even point between extension of a distribution system and the use of individual household water systems. The analysis of an area using these parameters indicates how far a distribution system can be extended economically. Transmission cost relationships are developed showing the effect of flow rate, distance, and elevation difference on the cost of water transmission. A simple equation indicates the economies of scale associated with shipping water over the route and eliminates the need for detailed calculations at each possible flow rate. A regional model determines the least cost arrangement of water supply facilities for meeting a fixed set of regional water demands. The model minimizes the cost of source development, treatment, and transmission, subject to the constraint that all demands must be satisfied. Two regions of North Carolina, Buncombe County and the Raleigh-Durham-Chapel Hill Research Triangle area, are examined using these techniques.
W73-04064

COMBINATION URBAN-POWER SYSTEMS UTILIZING WASTE HEAT,

Westinghouse Electric Corp., Pittsburgh, Pa.

For primary bibliographic entry see Field 05G.
W73-04350

3E. Conservation in Industry

SPRINKLER USE FOR SWINE COOLING,

California Univ., Davis.

S. R. Morrison, H. Heitman, Jr., R. L. Givens, and T. E. Bond.

Trop Agric. Vol 49, No 1, p 31-35. 1972. Illus.

Identifiers: *Sprinklers, *Swine cooling, Weight (Swine), Feeding (Swine).

Spray application of only 330 ml (0.09 U.S. gal) of water per hour pig resulted in a significant increase in rate of gain and improvement in feed conversion under the conditions of this test. Wetting enabled pigs to eat during the hottest part of the day when un-sprinkled pigs were rarely at the feeders. Operation of sprinklers above 21 degrees C gave highly significantly better results than above 30 degrees C, and operation at 60 min intervals was highly significantly better than 30 min intervals. Copyright 1972, Biological Abstracts, Inc.
W73-04266

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 03

Conservation in Agriculture—Group 3F

3F. Conservation in Agriculture

DEVELOPMENT OF ECONOMIC WATER HARVEST SYSTEMS FOR INCREASING WATER SUPPLY - PHASE II,

Arizona Water Resources Research Center, Tucson.

For primary bibliographic entry see Field 03B.

W73-03901

WATER USE EFFICIENCY OF VEGETABLE CROPS GROWN OVER ASPHALT MOISTURE BARRIERS,

Dalaware Univ., Newark. Water Resources Center.

E. N. Scarborough, and W. C. Liebhardt.

Available from the National Technical Information Service as PB-214 120, \$3.00 in paper copy \$0.95 in microfiche. Delaware Water Resources Center, Newark, Completion Report, December 1972, 14 p, 5 fig, 1 tab. OWRR A-012-DEL (1).

Descriptors: *Soil water, *Leaching, *Sands, *Nitrates, *Vegetable crops, *Asphalt, Barriers, Water requirements, Crop production, "Delaware, Efficiencies.

Identifiers: *Asphalt moisture barrier.

The effectiveness of a subsurface asphalt moisture barrier in increasing yields of vegetable crops grown on loamy sand soils was investigated. Six vegetable crops were grown under conditions of irrigation and no irrigation with and without a barrier. Average yield increases of all crops over the barrier without irrigation were 46%, 58% and 55% for 1967, 1968 and 1969 respectively. With irrigation, yield increases were 35%, 16% and 30% for 1967, 1968 and 1969. Yield increases were due to a combination of increased water retention and a reduction in nitrate leaching due to excessive rainfall. The barrier increased the water holding capacity of the soil in top 2 feet by approximately 1.25 inches or an additional 70% in available water. In laboratory studies with simulated barriers using high rates of nitrogen, 2 1/2 times as much nitrate remained in the top 2 feet of the soil compared to no barrier with a 5 inch application of water. A summary of yields by crop and graphs of the movement of nitrate, ammonium and potassium are included. The asphalt moisture barrier has proven to be an effective production practice with sandy soils where irrigation is not feasible.

W73-03902

USE OF INFORMATION ON THE AGROHYDROLOGICAL PROPERTIES OF SOIL IN THE COMPUTATION OF MOISTURE RESERVES IN FARM FIELDS, (IN RUSSIAN),

S. I. Smirnova, and E. V. Mamaeva.

Tr Inst Eksp Meteorol Gl Upr Gidrometeorol Sluzhby Pri Sov Minist SSR. 13, p 30-46. 1970.

Identifiers: Computation, *Farm fields, Humus, Hydrological information, *Soil moisture, Soils, USSR, Weight, Wilting.

Determinations were made of the bulk weight of soil (BW), wilting percentage (WP) and 'unproductive' moisture (UM) in the upper 100-cm layer. The WP and UM values proved to be closely similar. These parameters were determined in soils with different humus contents and of different textures. Statistically significant BW, WP and UM values were similar to deep Ciscaucasian chernozems. The variety of BW values are greater in the upper horizons (7-7.5%) than in the lower ones.—Copyright 1972, Biological Abstracts, Inc.

W73-03917

TRICKLE IRRIGATION...A MORE EFFICIENT MEANS OF WATER MANAGEMENT,

Texas A and M Univ., Weslaco. Agricultural Research and Extension Center.

For primary bibliographic entry see Field 03C.

W73-03953

AGRICULTURALLY-POLLUTED IRRIGATION WATER AS A SOURCE OF PLANT-PARASITIC NEMATODE INFESTATION,

Agricultural Research Service, Prosser, Wash. Irrigated Agriculture Research and Extension Center.

For primary bibliographic entry see Field 05B.
W73-03954

BOLD NEW DEVELOPMENT FOR IRRIGATION.

Reclamation Era, Vol 56, No 1, p 15-18, February, 1970. 3 fig.

Descriptors: *Irrigation practices, *Irrigation programs, Irrigation efficiency, Water conservation, Crop production, Groundwater.

Identifiers: *Irrigation scheduling, *Irrigation research.

Irrigation scientists generally agree in existence of the paradox that: Irrigations are perennially concerned with too-short supplies of water yet too much water is applied to the fields under current watering practices. The result is a complex mélange of wasted water, increased costs, reduced production, and lower farm efficiency. To strike at this contradiction, the Bureau of Reclamation has started a pilot program of scheduling irrigation water deliveries. Bureau personnel take soil moisture samples and deliver an irrigation schedule to the farmer. The results have been a 20 percent increase in crop yield with a 30 percent reduction in water use. Annual costs of 1 dollar per acre have produced benefits of \$35 per acre. (Skogerboe-Colorado State)
W73-03975

STARTING WITH TRICKLE IRRIGATION,

Business Dynamics Corp., Phoenix, Ariz.

For primary bibliographic entry see Field 03C.

W73-03958

IRRIGATION GUESSWORK - GOODBYE,

Bureau of Reclamation, Denver, Colo. Region 7.

N. Cassai.

Reclamation Era, Vol 56, No 2, p 16-18, May, 1970. 2 fig.

Descriptors: *Irrigation practices, *Irrigation programs, *Irrigation efficiency, Water conservation, Crop production, Groundwater, Wyoming, Nebraska.

Identifiers: *Irrigation scheduling, *Irrigation research.

Studies in using the computer to predict when and how much to irrigate are being conducted. The tests, conducted during 1969, were on 363 acres near McCook, Nebraska and 260 acres near Torrington, Wyoming. The principal crops in the test areas were: corn, sugarbeets, beans, alfalfa and small grains. Due to diseases the previous year direct correlation of yields was impossible. However, a significant increase was shown. The cost of the services, on a commercial basis, is estimated at between \$1.50 and \$4.00 per acre per year, depending on how much of the data is collected by the farmer. Water savings of from 10 to 15 percent were observed. Other benefits are: reduced labor costs, reduced fertilizer requirements, increased net returns, and fewer drainage problems. (Skogerboe-Colorado State)
W73-03976

OPTIMAL DESIGN OF FURROW LENGTH OF SURFACE IRRIGATION,

Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.

I-pai Wu, and T. Liang.

Journal of the Irrigation and Drainage Division, American Society of Civil Engineers, Vol 96, No 1R3, Paper 7543, p 319-332, 1970. 5 fig, 1 tab, 2 ref, 2 append.

Descriptors: *Furrow drainage, *Furrow irrigation, Irrigation, Irrigation efficiency, *Optimization, *Surface irrigation, *Systems analysis, Costs, Length.

Identifiers: Furrow length.

The furrow length design of an irrigation system can be optimized by analyzing overall irrigation system cost when the infiltration intensity function of soils, advance function of inflow stream inside the furrow, and other pertinent information are known. Computer programs were coded for obtaining optimal solution. The curves of cost functions usually have gentle slope close to optimum furrow length when stream size is fixed (advance function known). Therefore, the designer does have limited freedom of choosing a suitable furrow length without incurring extremely high cost. The length of furrow which falls in the interval where costs vary less than or equal to 5 percent of the optimal or the minimum cost is defined arbitrarily as adequate length. Results showed that the son of ordinary system and a cutback system was also conducted. The developed optimization technique can also be used to determine the length of the border. (Skogerboe-Colorado State)
W73-03975

CENTER PIVOT IRRIGATION,
Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.

D. Heermann.

World Irrigation, Vol 20, No 4, p 8-11, June, 1970. 6 fig, 1 tab.

Descriptors: *Sprinkler irrigation, Uniformity coefficient, *Irrigation systems, Arable land, Irrigation efficiency, Irrigation engineering, Crop production, Application methods, Runoff, *Automatic control.

Identifiers: *Center pivot irrigation, Sprinklers, Sprinkler design, Irrigation research.

Self-propelled center pivot sprinkler irrigation systems have been and are currently being installed in the United States. All systems are similar in that a line of sprinklers rotate about a pivot point. Typically one line is designed to irrigate approximately 135 acres of a 160 acre field. There is considerable variation in design and drive mechanisms of the systems. Since they are continually moving, center pivot systems perform especially well in the wind. Many misconceptions about the design and operation of center pivot systems have developed and an attempt to correct these is made. When properly designed, a center pivot system provides an efficient, automated irrigation system. (Skogerboe-Colorado State)
W73-03978

CONQUEST OF WASTES SHOW PRODUCTIVITY.

Reclamation Era, Vol 57, No 1, p 14-16, February, 1971. 3 fig.

Descriptors: *Reclaimed water, *Desalination, Greenhouses, Growth chambers, *Desalination apparatus, Experimental farms, *Mexico, Evapotranspiration control, Irrigation, Water reuse.

Identifiers: *Hydroponics, Research stations, Sea water irrigation.

Successful food production using waste, water, heat, and land is claimed by a controlled atmosphere farming experiment located on the University of Sonora Research Station at Puerto Penasco on the Gulf of California. Waste heat from diesel-electric generators is used to desalt sea water which is then used for irrigation. Giant inflated bubbles of 12-mil polyethylene film serve as the greenhouses. The crops are planted in sterile beach sand and the required nutrients are supplied by adding them to the irrigation water. The water is transpired by the plant and trapped in the sealed

Field 03—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation in Agriculture

greenhouse and recycled, thereby reducing the plant water requirements by 90 percent. (Skogerboe—Colorado State)
W73-03979

IRRIGATION SURVEY.

Irrigation Journal, Vol 21, No 5, p 10-17, September—October, 1971. 45 ref.

Descriptors: *Irrigation systems, *Irrigation practices, *Distribution systems, Statistics, *Surveys.
Identifiers: *United States.

A compilation is presented of statistics on irrigation, state by state, through 1970 including sprinkler and gravity methods, types of power equipment, and the various types of pipes used in irrigation lines. (Skogerboe—Colorado State)
W73-03980

SOIL—WATER RELATIONSHIP,

S. Ross.

Irrigation Journal, Vol 21, No 5, p 6-9, September—October, 1971. 2 fig, 3 tab.

Descriptors: *Irrigation practices, *Crop production, Irrigation efficiency, Soil moisture, Available water, Infiltration, Leaching, Moisture tension, Soil moisture meters, Soil-water-plant relationships, Tensiometers.

Identifiers: *Irrigation scheduling, *Irrigation research, Soil moisture measurements.

The use of water in irrigation, is receiving re-evaluation as emphasis on the total amount of water available for all uses becomes a more pressing problem. A few years ago, guesstwork was the most common method of determining the need for additional water. Today, however, the question of when and how much to irrigate is getting the technical attention it deserves. This very general summary was presented to show that useful data are available throughout the country—data that should be used in the design and operation of irrigation systems. (Skogerboe—Colorado State)
W73-03981

AGROPHYSICAL CHARACTERISTICS OF ORDINARY CHERNOZEMS IN EASTERN KAZAKHSTAN, (IN RUSSIAN),
For primary bibliographic entry see Field 02G.
W73-03996

TOPSOIL REACTION TO MECHANICAL PRESSURE,
For primary bibliographic entry see Field 02G.
W73-04057

SPRINKLING AND PONDING TECHNIQUES FOR RECLAIMING SALINE SOILS,
Agricultural Research Service, Riverside, Calif.
J. D. Oster, L. S. Willardson, and G. J. Hoffman.
Paper 72-210, 1972 Annual Meeting, American Society of Agricultural Engineers, Hot Springs, Arkansas, June 1972. 7 p, 2 fig, 1 tab, 5 ref.

Descriptors: *Leaching, *Ponding, *Sprinkling, Soil conservation, Saline soils, Soil properties, Salinity, Percolation, Infiltration, Soil water movement, Rates of application, Efficiencies, On-site tests, California, Evaporation, Electrical conductance, Soil profiles.

Identifiers: *Soil reclamation, *Land reclamation, Imperial Valley (Ca), Unsaturated flow, Field permeability tests, Sensors.

Reclaiming saline soil is usually accomplished by ponding for several months, despite evidence that intermittent ponding and sprinkling are more efficient in terms of water used. Salt displacement is

most efficient under unsaturated flow. Using sprinklers, the application rate must be less than the maximum percolation rate to maintain unsaturated conditions. An experiment in the Imperial Valley, California, compared continuous ponding, intermittent ponding, and sprinkling techniques in 3 plots of 1150 sq m. Twelve salinity sensors monitored leaching in each plot at depths of 53 cm and 66 cm at 3 positions on the centerline of each plot. Electrical conductivity was standardized at 25 deg C. Soil salinity for the sprinkler plot did not change for 25 days because of low application rate and lag in moisture movement. Salinity reduction for all treatments was most rapid immediately after the first application for continuous and intermittent ponding and during initial stages of downward movement of water from sprinkling. Time required to reduce salinity by half was the same for the 3 leaching techniques. In terms of water used, intermittent ponding is most efficient, followed by sprinkling. (USBR)
W73-04081

TRICKLE IRRIGATION SYSTEM DESIGN,

Texas A and M Univ., College Station.

T. A. Howell, and E. A. Hiler.
Paper 72-221, 1972 Annual Meeting American Society of Agricultural Engineers, Hot Springs, Arkansas, June 1972. 19 p, 2 fig, 3 tab, 10 ref.

Descriptors: *Design criteria, Irrigation design, Irrigation systems, Consumptive use, Irrigation efficiency, Computer programs, Distribution systems, Water distribution (Applied), Flow rates, Head losses, Orchards, Grapefruit, Flow charts.
Identifiers: *Computer applications, Computer-aided design, Trickle irrigation, Infiltration capacity, Spacing.

Trickle irrigation is the slow application of water to plants in the form of drops through mechanical emitters, offering great potential to areas with limited or costly water. System pressure losses are very small. A design procedure is presented for trickle laterals with non-uniformly spaced emitters in an orchard installation. Lateral design determines optimum pipe size and number of emitters per tree, neglecting runoff. Peak consumptive use rate depends on type of crop and climate. A Fortran V program accounted for pressure drop, emitter flow rate, total lateral flow, tree spacing, number of emitters per tree, emitter spacing, pressure at lateral end, field slope, and lateral length. A program flow chart is presented. Design procedure is given in 7 steps, and lateral design examples provided. The proposed method may lead to overdesign, requiring application of practical experience. Experimental verification of pressure distribution predicted by the computer has not been conducted. (USBR)
W73-04082

SOIL AIR PRESSURE AND WATER INFILTRATION UNDER BORDER IRRIGATION,
Agricultural Research Service, Reno, Nev.
For primary bibliographic entry see Field 02G.
W73-04087

EFFECTS OF IRRIGATION, MANGANESE SULPHATE AND SULPHUR APPLICATIONS ON COMMON SCAB OF THE POTATO,
Loughry Agricultural Coll., Cookstown (Northern Ireland).

For primary bibliographic entry see Field 05G.
W73-04167

COMMON POTATO SCAB: EFFECTS OF IRRIGATION, MANGANESE SULPHATE AND SULPHUR TREATMENTS FOR COMMON POTATO SCAB ON MINERAL COMPOSITION OF PLANT MATERIAL AND SOIL EXTRACTS,
Loughry Agricultural Coll., Cookstown (Northern Ireland).

For primary bibliographic entry see Field 05G.

W73-04168

GEOGRAPHICAL VARIATIONS IN YIELD—WEATHER RELATIONSHIPS OVER A LARGE WHEAT GROWING REGION,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.

G. D. V. Williams.

Agric Meteorol, Vol 9, No 3/4, p 265-283, 1972. Ilus.

Identifiers: *Canada, Evapotranspiration, Geographical variation, Humidity, Precipitation, Transpiration, Weather, *Wheat-M, *Crop yield.

Within a large wheat growing region, the Canadian prairies, large differences were found in the relationships of wheat yield fluctuations to weather variations. Regression analyses were performed independently on 8 non-overlapping groups of districts, using data from the 1952-1966 period and considering each district-year in a group as a separate case. The weather variables included May, June and July precipitation and potential evapotranspiration, pre-season conserved precipitation, and some 2nd-degree variables formed from these. Correlations of yields with weather variables were greatest in the driest areas, where only one weather variable was needed to explain 40% of the yield variance. In the most humid parts of the region at least 3 such variables were needed, and it appeared that there was often too much moisture for maximum yields. Potential applications and possible improvements in the weather-based yield estimation procedures are suggested. The method could be adapted for other crops and for other regions of the world, and could help in long range planning of land use and short range planning to move grain from areas of surpluses to areas of shortages.—Copyright 1972, Biological Abstracts, Inc.
W73-04171

WATER ABSORPTION BY WHEAT SEEDS AS INFLUENCED BY HYDRAULIC PROPERTIES OF SOIL,
Manitoba Univ., Winnipeg. Dept. of Soil Science.

J. Ward, and C. F. Shaykewich.

Can J Soil Sci, Vol 52, No 1, p 99-105, 1972.

Identifiers: *Absorption, Seeds, *Soil properties, *Wheat seeds.

Water diffusivity and hydraulic conductivity of wheat seeds were determined. At water contents approaching those required for germination, hydraulic conductivity of the seed was similar to those normally found in soils at the dry end of the available water range. Water uptake by seeds from soils indicated that both water potential and hydraulic conductivity of the soil influenced rate of water uptake. When seeds were buried in soil, water uptake rate was generally greater in the Chateaugay soil than in the Wellwood soil. This was a significant observation since at a given potential, hydraulic conductivity was greater in the Chateaugay than in the Wellwood soil. It was concluded that seed hydraulic conductivity is a useful parameter in understanding water absorption by seeds from soil.—Copyright 1972, Biological Abstracts, Inc.
W73-04172

EFFECT OF NITROGEN SOURCE ON CORN AND BROMEGRASS PRODUCTION, SOIL PH, AND INORGANIC SOIL NITROGEN,
Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center.

J. F. Power, J. Alessi, G. A. Reichman, and D. L. Grunes.

Agron J, Vol 64, No 3, p 341-344, 1972.

Identifiers: Ammonium, *Bromegrass, Bromus inermis M, Calcium, *Corn-M, Fertilizers, Grass-M, Nitrates, *Nitrogen, *Soils, Urea, Zea mays M, Soil pH, Soil nitrogen.

WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

Conservation in Agriculture—Group 3F

Little information is presently available on the effects of N source on dryland crop production in the Northern Plains. Therefore a field experiment was conducted for 4 yr to assess the relative merits of ammonium sulfate, ammonium nitrate, calcium nitrate, and urea applied annually at 55 and 110 kg N/ha to both corn (*Zea mays*, L.) and bromegrass (*Bromus inermis*, L.) grown on a fine sandy loam (pacific haploboroll) with surface pH of 6.5 and no free carbonates. Plants were harvested at maturity and soils were periodically sampled for water content, inorganic N content, and pH. Corn production was highest for ammonium sulfate and ammonium nitrate at 110 kg N/ha. Leaf tissue at silking from all fertilized corn contained over 2.8% total N. Soil inorganic N accumulating during the first 3 yr under corn was leached below the root zone by 514 mm of precipitation during the fourth growing season. At the 110-kN rate, bromegrass production was lowest with urea, possibly because of ammonia volatilization. Nitrate sources of N greatly enhanced early season growth of bromegrass. All fertilizer N applied was immobilized in the bromegrass ecosystem, prohibiting any carryover or leaching of soil nitrate. Soil pH changes due to fertilization were not reflected in plant growth.—Copyright 1972, Biological Abstracts, Inc.
W73-04224

POSTHARVEST CULTURAL PRACTICES AFFECTING THE ROOTING OF KENTUCKY BLUEGRASS SODS GROWN ON ORGANIC AND MINERAL SOILS.
Arkansas Univ., Fayetteville. Dept. of Agronomy.
J. W. King, and J. B. Beard.
Agron. J., Vol 64, No 3, p 259-262, 1972, Illus.
Identifiers: Grass-M, Harvest, Irrigation, *Kentucky bluegrass, *Mineral soils, Moisture, *Organic soils, Poa-Pratensis-M, Rooting, Seedhead, Sods, Soil types.

The effects of sod type, fertilizer placement, underlying soil type, soil moisture, sod harvest depth, and the postharvest irrigation rate on the transplant rooting capability were investigated. Market-quality Merion Kentucky bluegrass (*Poa pratensis* L.) sod, grown on organic and mineral soils, was transplanted to glass-faced root observation boxes. Root production data and counts of roots visible on the glass face were collected. Harvesting sod at a standard 2-cm depth of cut was superior to 1-cm in terms of root growth after transplanting. The 1-cm-thick sod was more prone to desiccation injury. Transplanting sod onto sandy loam topsoil of a 1:1 topsoil-subsoil mix resulted in increased root production compared to a clay loam subsoil. Transplanting sod to dry soil resulted in delayed rooting. No difference in root production between soil-incorporated and sod surface fertilizer placement was found in these short-term studies. Sod grown on organic soil produced more roots in 16-24 days following transplanting than sod grown on mineral soil. Transplant sod rooting was impaired during the May-June period of extensive seedhead development.—Copyright 1972, Biological Abstracts, Inc.
W73-04175

STRUCTURAL COMPOSITION AND NUTRIENT STATUS OF CALCAREOUS CHERNOZEM IN CROP ROTATION, (IN RUSSIAN), N. E. Red'kin.
Tr Kuban-S-Kh Inst. Vol 20, No 48, p 112-121, 1970.
Identifiers: Alfalfa-D, Calcareous soils, *Chernozem, *Crop rotation, Grass-M, Structural composition, Wheat-M, *Soil nutrients.

The content of stable aggregates in the soil under winter wheat after different preceding crops was determined. The soil structure was consistently higher under wheat grown in the first or second yr after alfalfa. The content of water-resistant aggregates in such fields approached the total con-

tent of water-resistant aggregates in old fallow. The soil retained its relatively great structural strength only during the first 3 or 4 yr after alfalfa. The maximum content of total N occurred immediately after alfalfa. The prolonged use of calcareous chernozem for grain crops decreased the N in soil. The content of total N in the arable layer cultivated for a prolonged period was 2.2 tons/ha less than in old fallow. Perennial grasses increased the content of total P in soil but slightly decreased P mobility. P fertilizers improved soil productivity in the first year after alfalfa.—Copyright 1972, Biological Abstracts, Inc.
W73-04224

PHOTOSYNTHETIC RESPONSE TO DROUGHT IN MAIZE,
Connecticut Agricultural Experiment Station, New Haven.
G. H. Heichel.
Philip Agric. Vol 54, No 3/4, p 102-114, 1970. Illus.
Identifiers: Carbon dioxide, *Drought, Leaf, *Maize-M, Oxide, *Photosynthesis, Stomatal closure, Water potential (Leaves), Infrared gas analysis.

The photosynthesis of leaves of several corn varieties in the field was measured by IR gas analysis in a well-ventilated, brightly illuminated chamber. Photosynthesis was correlated with leaf water potentials measured by thermocouple psychrometry on the same leaves. Three distinct patterns of response to drought were found among 12 varieties of maize: photosynthesis declined with leaf water potential, but without apparent stomatal control; photosynthesis declined with leaf water potential and stomatal conductivity; and photosynthesis declined with stomatal conductivity, but responded little to decreasing leaf water potential. The CO₂ compensation concentration was increased by drought, showing that photosynthetic activity was depressed or that respiration increased independent of stomatal closure.—Copyright 1972, Biological Abstracts, Inc.
W73-04260

EFFECT OF IRRIGATION, FERTILIZATION AND PLOWING DEPTH ON QUANTITY OF WHITE WHEAT AND MAIZE,
V. P. Kirichenko.
Fiziol Biokhim Kul't Rast. Vol 3, No 6, p 646-646, 1971.
Identifiers: Ascorbic-acid, Carbohydrates, *Fertilization, Irrigation, *Maize-M, Plowing depth, *Wheat-M, Winter.

An improvement in the water supply application of fertilizer and deeper plowing of winter wheat and maize stimulated the formation of chlorophyll and the outflow of photosynthetic products (carbohydrates, ascorbic acid) from leaves into other organs (tiller node, winter wheat spike), and increased the content of N and P. The increase in yield and improvement of its quality were due to better growth and development of plants, and to an increase in the intensity of the physiological and biochemical processes.—Copyright 1972, Biological Abstracts, Inc.
W73-04267

NUTRITIONAL AND WATER REQUIREMENTS OF BUCKWHEAT,
V. N. Yakimenko.
Agrokhimiya. 3, p 66-71, 1971.
Identifiers: *Buckwheat-D, Weather, Soils, *Nutrient balance.

The position of buckwheat in crop rotation and especially weather conditions during the growing period have considerable effect on the water-consumption coefficient, yield and structure of buckwheat. Improvement in the nutrient balance of the soil occurred with the placement of buckwheat after the best precursors, and allowed

the most efficient consumption of water from the soil and highest yields. The concentration of N, P and K in the grain and chaff of buckwheat is directly related to the presence of forms of these elements in the soil which are available to the plant. In contrast to prevailing opinions, the N requirement of buckwheat is much greater than the K requirement on sod-podzolic and podzolized soils. This is why N fertilizers are very effective for buckwheat.—Copyright 1972, Biological Abstracts, Inc.
W73-04268

INVESTIGATIONS ON THE WATER UPTAKE OF CRACKING AND NONCRACKING COTYLEDONS OF BEAN SEEDS (PHASEOLUS VULGARIS L.) (IN GERMAN),
Staatsinstitut fuer Angewandte Botanik. Hamburg Univ. (West Germany).
G. Retzlaff.
Biochem Physiol Pflanz (BPP). Vol 161, No 6, p 560-576, 1970. Illus. English summary.
Identifiers: *Bean-D, *Cotyledons, Phaseolus-vulgaris-D, *Seeds (Water uptake).

With an initial water-content of 11% noncracking cotyledons take up more water than cracking ones. The velocity of swelling of noncracking and cracking cotyledons with a water content of 11% increases, raising the water content. The velocity of swelling reaches a maximum at various water contents depending on the bean type. After a subsequent increase of the water content, the velocity of swelling decreases again. With increasing water content, the velocity of swelling of cracking cotyledons increases absolutely and relatively more than that of noncracking ones. The cracking decreases continuously with an increase in the initial water content of the cotyledons. At an initial water content of 21% no cracking occurs during the soaking process. By an increase in the water content from 11% to 21% the humidity is distributed completely in the cotyledons causing changes in the manner of cracking. After dampening, cotyledons crack earlier in the early hours of a new soaking process than undampened cotyledons. With longer periods of storage, the cross ruptures increase in length, extending to the ends of the cotyledons. After a dampening of 10 hr, cross ruptures occur only in the middle of the cotyledon. After 22 hr moisture, no ruptures occur during the soaking process.—Copyright 1972, Biological Abstracts, Inc.
W73-04301

LYSIMETRIC METHOD OF EXAMINING THE DEGREE OF DEHELMINTHIZATION OF SEWAGE (IN RUSSIAN),
Institute of Medical Parasitology and Tropical Medicine, Moscow (USSR).
For primary bibliographic entry see Field 05D.
W73-04448

TO AUTHORIZE CONSTRUCTION, OPERATION AND MAINTENANCE OF THE NORTH LOUP DIVISION, PICK-SLOAN MISSOURI BASIN PROGRAM, NEBRASKA.
For primary bibliographic entry see Field 06E.
W73-04459

SOIL MOISTURE PRESSURE AND RELATIVE TRANSPERSION OF PLANTS IN THE CASE OF SOIL DROUGHT (IN RUSSIAN),
Moscow State Univ. (USSR).
For primary bibliographic entry see Field 02D.
W73-04524

Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control of Water on the Surface

04. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control of Water on the Surface

A SURVEY OF ATTITUDES TOWARDS THE MISSISSIPPI RIVER AS A TOTAL RESOURCE IN MINNESOTA,
Minnesota Univ., St. Paul. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W73-03905

FLOOD FORECASTING IN THE UPPER MIDWEST - DATA ASSEMBLY AND PRELIMINARY ANALYSIS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.

A. F. Pabst, C. E. Bowers, and D. G. Baker.
Available from the National Technical Information Service as PB-214 091, \$3.00 in paper copy, \$0.95 in microfiche. Project Report No. 137, June 1972, 57 p, 17 fig, 9 tab. OWRR B-060-Minn (1). 14-31-0001-3605.

Descriptors: *Flood forecasting, *Mathematical models, *Watersheds (Basins), *Computer programs, *Hydrologic data, Meteorological data, Forecasting.
Identifiers: Stanford model, Mass storage medium, Subroutine RANDSK.

This project was Phase I of a three-phase study whose objective is the development of analytical procedures and the correlation of hydrological data to aid in the prediction and control of spring floods in large Upper Midwest watersheds. Phase I has involved the assembly of meteorological and hydrological data for various periods and the procurement and preliminary evaluation of selected mathematical simulation models of watersheds. Phases II and III have been authorized under a project which begins July 1, 1972. The major portion of the hydrological and meteorological data were procured on magnetic tape to facilitate input into the mathematical models. This form is highly desirable, as some runs were performed with up to one year's data. Approximately 28 magnetic tapes were received and a duplicate was made of each to serve as a backup copy. Of special interest in this study were the SSARR model developed by the Corps of Engineers and the National Weather Service, the Kentucky-Stanford model, the HEC-1 model of the Corps of Engineers Hydrologic Engineering Center, and programs in use by the National Weather Service River Forecast Center in Kansas City (Walton-Minnesota)
W73-03906

STREAMFLOW ROUTING (WITH APPLICATIONS TO NORTH CAROLINA RIVERS),
North Carolina Water Resources Research Inst., Raleigh.

M. Amein, and C. S. Fang.
Available from the National Technical Information Service as PB-214 366, \$3.00 in paper copy, \$0.95 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No. 17 (revised), September 1969. 106 p, 20 fig, 2 tab, 19 ref, append. OWRR A-001-NC (5).

Descriptors: *Unsteady flow, *North Carolina, *Equations, *Approximation methods, *Channel flow, Computer programs, Flood flow, Canals, Surges, Reservoir operation, Momentum equation.

Identifiers: *Implicit method, *Neuse River (NC), Tidal flow, Mass conservation equation, Artificial channel flow.

Problems of the unsteady aspects of the flow of water arise in the planning, design, and management of water resources when computations must be made on flood flows, a reservoir regulation, surges in canals, tidal flows, etc. A powerful analytical tool for the investigation of unsteady flows is available in the equations of conservation of mass and momentum. Although approximate solutions of these equations have been used on a large scale, the digital computer has made it feasible to obtain complete solutions of the equations by numerical methods. Three methods of solution, the explicit, characteristic, and implicit methods, were investigated and applied to artificial and natural channels. The natural channel selected for this purpose was a reach of the Neuse River, North Carolina. Even though the three methods provided almost identical solutions, there is much difference among them so far as speed, reliability, simplicity, and convenience are concerned. The procedure for finding solutions by the implicit method proved to be fast, accurate, and convenient, and highly suitable for problems involving flow in natural river channels of complex geometry. This study is the first in which this type of analysis has been used. The advantages of the implicit method make it feasible to use this sophisticated tool for the solution of unsteady flow problems in a routine manner. (See also W69-03564)
W73-03908

GAZETTEER OF NATURAL DRAINAGE AREAS OF STREAMS AND WATER BODIES WITHIN THE STATE OF CONNECTICUT,
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 07C.
W73-03914

MODEL STUDIES OF NAVIGATION IMPROVEMENTS, COLUMBIA RIVER ESTUARY: REPORT 2, SECTION 3, FIXED-BED STUDIES OF DISPOSAL AREAS C AND D,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08B.
W73-03915

OPTIMAL DESIGN OF FURROW LENGTH OF SURFACE IRRIGATION,
Hawaii Univ., Honolulu. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-03975

UTILIZATION OF DEEP WATER HEAT IN RESERVOIRS FOR THE MAINTENANCE OF UNFROZEN WATER AREAS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W73-04034

SELECTION OF TEST VARIABLE FOR MINIMAL TIME DETECTION OF BASIN RESPONSE TO NATURAL OR INDUCED CHANGES,
Colorado State Univ., Fort Collins. Environmental Resources Center.
H. J. Morel-Seytoux.

Available from National Technical Information Service as PB-214 114, \$3.00 in paper copy, \$0.95 in microfiche. Colorado Environmental Resources Center Completion Report Series No 40, December 1972. 15 p, 2 fig, 1 tab, 14 ref. OWRR A-011-COLORADO (2).

Descriptors: Time, Constraints, *Optimization, *Statistical methods, *Colorado River basin.
Identifiers: *Minimization procedures, Detection tests, *Basin response (Change).

Classical statistical tests have been utilized to assess whether an apparent change in basin response is the result of nature's caprice or of man's deliberate action. Often the physical information about the variable tested has been neglected. As a result the tests used are not optimal. Detection tests which utilize both the physical and statistical information can be designed and they will have a superior power to the standard tests. The test variable to be used is a linear combination of several physical and random variables with weight factors determined by a minimization procedure. The minimization is restricted by several equality constraints of a physical origin. When applied to the Colorado River Basin Pilot Project area the power of the test, expressed in years needed for detection, is increased by a factor of two.
W73-04061

A STUDY OF WATER INSTITUTIONS OF HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W73-04062

STOCHASTIC ANALYSIS OF MONTHLY FLOW DATA APPLICATION TO LOWER OHIO RIVER TRIBUTARIES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
A. I. McKerchar, and J. W. Delleur.

Available from the National Technical Information Service as PB-214 115, \$3.00 in paper copy, \$0.95 in microfiche. Indiana Water Resources Research Center, Lafayette, Technical Report No 26, 1972. 104p, 14 fig, 14 tab, 30 ref, 1 append. OWRR-B-036-IND (2).

Descriptors: *Synthetic hydrology, *Stochastic processes, *Time series analysis, *Runoff forecasting, *Regression analysis, Flow rates, *Ohio River, Model studies, Watersheds (Basins).
Identifiers: Flow simulation, *Flow forecasting, *Autoregression method.

Past works in the stochastic analysis of runoff data are briefly reviewed. A summary of a recent technique for developing stochastic models for forecasting seasonal time-series is given. This technique, which applies a combination of autoregression and moving-average processes to represent referenced series which minimizes the uncertainties in the model by minimizing the number of parameters that need to be estimated is called the autoregression integrated moving-average (ARIMA) method. This method is applied to monthly flow data of 14 watersheds contributing to the Ohio River within the states of Indiana, Illinois, Kentucky and Ohio. Two models of monthly flow data were developed. In the first, a transformation was applied to the logarithms of the flow series to remove the seasonal effects and the application of the ARIMA approach to resultant stationary series showed that these series could be represented by a second order autoregressive process. In the second application, it was shown that a seasonal ARIMA model fitted the natural series well. The models are compared for their suitability to forecast data one and more months ahead. The annual flows for the watersheds considered were independently distributed and could be represented by normally random deviates of appropriate mean and variance.
W73-04063

A DYNAMIC PROGRAMMING STUDY OF VARIOUS DIVERSION LOSSES,
Washington State Water Research Center, Pullman.
R. D. Dutton, and C. B. Millham.

Available from the National Technical Information Service as PB-214 126, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report, August

WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

Control of Water on the Surface—Group 4A

30, 1972. 16p, 6 tab, 5 ref. OWRR A-049-WASH (1).

Descriptors: Dynamic programming, *Diversion losses, *Pollution abatement, Pacific Northwest U.S., *Columbia River, *Model studies.
Identifiers: Snake River.

Results are presented of an assessment of diversion losses for power generation and pollution abatement that would accrue to the Pacific Northwest if water were diverted above Browne Dam on the Snake River or above McNary Dam on the Columbia River. It is assumed the water diverted is removed from the Pacific Northwest to other geographic regions, no return flows are assumed to be present. The tool of analysis is dynamic programming. A six-dam, twelve-time-period model with 50,544 states per stage is constructed and computed. Unimodality of the objective function is proved and the states are partitioned into equivalence classes allowing exceptionally fast solution algorithms. Data for the value per acre-foot for power generation is derived for all Snake-Columbia system dams using the expected cost during the decade 1970-1980 of replacing the lost water by nuclear capability. Using this together with well-known data for pollution abatement, an assessment of losses due to diversion for power generation and pollution-abatement is arrived at.

W73-04068

HYDROLOGIC ASPECTS OF FRESHENING UPPER OLD TAMPA BAY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02H.

W73-04094

STOCHASTIC STRUCTURE OF WATER USE TIME SERIES,
Colorado State Univ., Fort Collins.
J. D. Salas-La Cruz, and V. Yevjevich.
Colorado State University Hydrology Paper, No 52, June 1972. 71 p, 80 fig, 32 tab, 21 ref, 4 append.

Descriptors: *Water utilization, *Time series analysis, *Stochastic processes, Analytical techniques, Mathematical models, Irrigation, Hydroelectric power, Municipal water, Precipitation (Atmospheric), Temperature, Correlation analysis, Hydrology, Water balance, Water resources.

The stochastic structure of water use time series is studied. Data of urban, irrigation, and hydropower water use were obtained from different geographic locations of the United States, and a detailed analysis of their deterministic and stochastic components was performed. A general mathematical method is developed for the analysis of water use time series which permits the identification, estimation and removal of annual trends in the mean and standard deviation; annual periodicities in the mean, standard deviation and autocorrelation coefficients; the time dependence structure; and finally the reduction of the original nonstationary process to a second-order stationary and independent process. Subsequently a general deterministic-stochastic model is proposed for representing water use time series. The time dependence of the stochastic component of weekly, monthly, and annual water use may be well approximated by the first, second, or third order Markov models and the distribution of the independent stochastic component by the normal, log-normal-3, or gamma-3 functions. The explained variances of each deterministic-stochastic component are also determined. (Woodard-USGS)

W73-04098

FLOATABLE BREAKWATER ELEMENT,
For primary bibliographic entry see Field 08A.
W73-04153

WATER SHORTAGE IN THE FOREST FLOOR OF SUBALPINE FORESTS OF ALBERTA,
Canadian Forestry Service, Edmonton (Alberta).
D. L. Golding, and C. R. Stanton.
Can J For Res, Vol 2, No 1, p 1-6, 1972.
Identifiers: Abies-G, *Alberta (Canada), Forest floors, Forests, Picea-G, Pinus-Contorta-G, Subalpine forests, *Water shortage.

Water storage by the forest floor and its relation to other characteristics of the forest floor were determined for 3 forest types: spruce-fir (*Picea spp.*, *Abies spp.*) partially, cut spruce-fir, and young lodgepole pine (*Pinus contorta Dougl.*), and 3 predominant aspects (north, south, and east) on Marmot Creek experimental watershed. There was no significant difference between uncut and partially-cut spruce-fir forest floors in water-storage capacity, depth of water held after draining, water held/unit thickness of forest floor, or dry weight, although forest-floor thickness was greater under uncut spruce-fir (11.36 cm) than partially cut (9.84 cm). The forest floor averaged for cut and uncut spruce-fir had greater water storage capacity (1.93) than under young lodgepole pine (1.35), greater depth of water held (1.94 cm, 0.85 cm), greater dry weight (89.506 kg/ha, 55.039 kg/ha), and greater thickness (10.60 cm, 4.59 cm). There was no difference in water held/unit thickness of forest floor (0.19 cm/cm under spruce-fir, 0.18 cm/cm under pine). The lower values for pine than for spruce-fir are attributed to an intense fire 30 yr before on the area supporting the young pine. Regressions are given of water held on forest-floor thickness, weight of water held on dry weight, and water storage capacity on thickness.—Copyright 1972, Biological Abstracts, Inc.

W73-04169

BATHYMETRIC RECONNAISSANCE OF TOPAZ LAKE, NEVADA AND CALIFORNIA,
Geological Survey, Carson City, Nev.
For primary bibliographic entry see Field 07C.

W73-04192

ESTIMATING SALINITY OF STREAMS IN THE SOUTHWESTERN UNITED STATES,
Agricultural Research Service, Chickasha, Okla.
Southern Great Plains Watershed Research Center.
H. B. Pionke, A. D. Nicks, and R. R. Schoof.
Water Resources Research, Vol 8, No 6, p 1597-1604, December 1972. 3 fig, 4 tab, 9 ref.

Descriptors: *Salinity, *Streamflow, *Statistical models, *Southwest U.S., Regression analysis, Mathematical models, Base flow, Surface waters, Water chemistry, Water quality.

A model is presented for the improved estimation of stream salinity as a function of streamflow components. The proposed model was constructed by using base flow and the ratio of surface to base flow. Among individual parameters tested, the ratio of surface flow to base flow was the best salinity predictor for ephemeral streams. Conversely, total flow was the best individual predictor for the stream draining the largest watershed. The proposed model explained 77.1%-95.2% of the variability in stream salinity and never exceeded a 30% error for any stream as determined from the standard error of estimate. It was found to estimate more precisely and accurately the salinity of streams characterized by ephemeral flows than other models. (Knapp-USGS)

W73-04198

COMPARISON OF MULTIPLE REGRESSION AND PRINCIPAL COMPONENT REGRESSION FOR PREDICTING WATER YIELDS IN KENTUCKY,
Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
C. T. Haan, and D. M. Allen.
Water Resources Research, Vol 8, No 6, p 1593-1596, December 1972. 4 tab, 4 ref.

Descriptors: *Statistical methods, *Water yield, *Regression analysis, Computers, Data processing, *Kentucky.
Identifiers: Principal component analysis.

Among the techniques that may be used to estimate water yield are multiple regression and regression on the principal components of data matrices. These two techniques are compared and applied to the problem of predicting water yields in Kentucky. The usefulness of principal components as predictor variables is not clear. Multiple regression requires much less labor. When variables are eliminated on the basis of statistical tests, they need not be measured. There is usually a clear interpretation of the remaining variables. (Knapp-USGS)
W73-04199

STABILITY AND THE CONSERVATION OF MASS IN DRAINAGE BASIN EVOLUTION,
University of Western Ontario, London. Dept. of Geography.

For primary bibliographic entry see Field 02A.

W73-04202

A NEW TOPOLOGICAL RELATIONSHIP AS AN INDICATOR OF DRAINAGE NETWORK EVOLUTION,
Environment Consultants, Inc, Dallas, Tex.

D. M. Coffman, E. A. Keller, and W. N. Melhorn.
Water Resources Research, Vol 8, No 6, p 1497-1505, December 1972. 12 fig, 11 ref. OWRR A-022-IND (2).

Descriptors: *Watersheds (Basins), *Drainage area, *Drainage patterns (Geologic), *Geomorphology, *Topography, Mathematical studies, Methodology, Drainage systems, Correlation analysis, Runoff, Curves, Equations, Data collections, Boundaries (Surfaces), Networks.

Identifiers: *Natural drainage boundaries, *Stream order predictions, Topological relationships, Bifurcation ratios.

The relationship between the number of links and segments of natural drainage networks is restricted to a narrow envelope. Theoretically, within this envelope a family of curves with the general form $y \pm 2x + 1 - 2$ to n th power is defined, where y is the number of links, x is the number of segments, and n is the Strahler stream order defined for $n = 2, 3, 4, 5$. Comparison with more than 100 natural drainage networks indicates these curves delineate threshold and hypothetical boundary conditions that may be used to predict stream order. Although a number of Strahler orders are possible for a network composed of a fixed set of links and segments, the data suggest only one most probable order appears in nature. As drainage networks develop from simple to complex, the range of bifurcation ratios fluctuates until a nearly constant value is reached. For any network of given order the bifurcation ratio increases to an improbable value whereupon branching increases the network's order, thus decreasing its bifurcation ratio. (Woodard-USGS)
W73-04203

QUANTITATIVE CHARACTERIZATION OF CHANNEL NETWORK STRUCTURE,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
For primary bibliographic entry see Field 08B.

W73-04204

TRANSIENT ANALYSIS OF THE DETROIT RIVER BY THE IMPLICIT METHOD,
National Ocean Survey, Detroit, Mich. Lake Survey Center.

For primary bibliographic entry see Field 02E.

W73-04207

Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control of Water on the Surface

SEEPAGE FROM SHALLOW RESERVOIR,
Canterbury Univ., Christchurch (New Zealand).
Dept. of Civil Engineering.
B. W. Hunt.

Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol 99, No HY1, Paper
9476, p 23-30, January 1973. 3 fig, 5 ref, append.

Descriptors: *Seepage, *Reservoir leakage,
*Groundwater movement, *Equations, Saturated
flow, Numerical analysis, Recharge, Pit recharge,
Water spreading.

An easily applied, approximate solution is given
for the steady-state, axisymmetric seepage from a
reservoir. The solution is obtained under the as-
sumptions that the flow is fully saturated, that the
aquifer is homogeneous and isotropic, and that the
reservoir is relatively shallow. This approximate
solution is compared with one known numerical
solution, and reasonable agreement is obtained.
(Knapp-USGS)
W73-04221

**DISPERSION FROM PIT IN UNIFORM
SEEPAGE,**
Canterbury Univ., Christchurch (New Zealand).
Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-04222

**COMBINED USE OF OPTIMIZATION AND
SIMULATION MODELS IN RIVER BASIN
PLANNING,**
John F. Kennedy School of Government, Cam-
bridge, Mass.
For primary bibliographic entry see Field 06A.
W73-04275

**OPPORTUNITY COSTS OF A TRANSBASIN
DIVERSION OF WATER I. METHODOLOGY,**
Hawaii Univ., Honolulu. Dept. of Economics; and
Hawaii Univ., Honolulu. Water Resources
Research Center.
J. E. T. Moncur.
Water Resources Research, Vol 8, No 6, p 1415-
1422, December, 1972. 22 equ, 6 ref.

Descriptors: *Diversion, *River basins, *Multi-
purpose reservoirs, *Feasibility, *Planning,
*Linear programming, *Dynamic programming,
*Water supply, Water demand, Reservoir
releases, Optimization, Estimating, Biochemical
oxygen demand, Dissolved oxygen, Southwest
U.S., *Columbia River, Mathematical models,
Systems analysis.
Identifiers: *Opportunity costs, *Transbasin water
diversion.

Water planning agencies in arid and semi-arid re-
gions of the southwestern states have long been
under pressure to obtain water supplies sufficient
to satisfy demands in their fastly growing regions.
One source of supply is the possibility of import-
ing water from rather distant river basins. A large-
scale transbasin water diversion project must be
feasible not only in terms of the direct costs of
transporting water but also in terms of the value of
services foregone by the exporting region due to
the diminution of its water supply. A general
model is developed for estimating the opportunity
costs of diverting water outside a river basin. The
procedure adapts the decomposition algorithm for
linear programs to optimize operations of the
water system with respect to time, multiple com-
plementary and competitive uses, and location,
with allowances made for serial as well as parallel
configurations of reservoirs. The algorithm solves
iteratively for the optimal value of the river's ser-
vices. Two solutions are sought: one assuming
'natural' inflow conditions and one assuming
depleted inflows to simulate the situation after a
diversion. The difference between these optimal
values is a measure of the opportunity costs in-

curred by the water-exporting region. (Bell-Cor-
nell)
W73-04276

**A COMPARISON OF MORPHOMETRIC MEA-
SURES OF BANKFULL,**
Sydney Univ. (Australia). Dept. of Geography.
For primary bibliographic entry see Field 02E.
W73-04375

**USING CANONICAL CORRELATION FOR
HYDROLOGICAL PREDICTIONS,**
Forest Service (USDA), Glendora, Calif. Pacific
Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 02E.
W73-04381

**THE LATERAL INFLOW INTO SUBMERGED
DRAINS,**
Ghent Rijksuniversiteit (Belgium). Laboratorium
voor Hydraulica.
For primary bibliographic entry see Field 08B.
W73-04384

**MURRELLS INLET, SOUTH CAROLINA:
NORTHPORT HARBOR, WISCONSIN.**
For primary bibliographic entry see Field 06E.
W73-04453

**A STUDY OF THE NEED FOR AND FEASIBIL-
ITY OF A PROGRAM FOR THE REMOVAL
AND DISPOSAL OF DRIFT AND OTHER
DEBRIS, INCLUDING ABANDONED VESSELS,
FROM THE PUBLIC HARBORS AND AS-
OCIATED CHANNELS UNDER THE JU-
RISDICTION OF THE DEPARTMENT OF THE
ARMY.**
For primary bibliographic entry see Field 08A.
W73-04455

**PLAQUEMINES LOCK CLOSURE, MISSISSIPPI
RIVER AND TRIBUTARIES PROJECT,
IBERVILLE PARISH, LOUISIANA, AS-
OCIATED WATER FEATURES, BAYOU
PLAQUEMINES AND GULF INTRACOASTAL
WATERWAY (FINAL ENVIRONMENTAL IM-
PACT STATEMENT).**
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 08D.
W73-04457

**EAST FORK OF WHITEWATER RIVER, INDI-
ANA AND OHIO (FINAL ENVIRONMENTAL
IMPACT STATEMENT).**
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-04458

**TO AUTHORIZE CONSTRUCTION, OPERA-
TION AND MAINTENANCE OF THE NORTH
LOUP DIVISION, PICK-SLOAN MISSOURI
BASIN PROGRAM, NEBRASKA.**
For primary bibliographic entry see Field 06E.
W73-04459

**FRIE RIVER, THREE RIVERS, TEXAS; MIS-
SISIPPI RIVER AT WINONA, MINNESOTA;
SURVEY RESOLUTIONS.**
For primary bibliographic entry see Field 06G.
W73-04463

SAVANNAH RIVER BASIN INSPECTION.
For primary bibliographic entry see Field 06E.
W73-04472

**GENESEE RIVER BASIN, NEW YORK AND
PENNSYLVANIA (FINAL ENVIRONMENTAL
IMPACT STATEMENT).**
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-04475

**CONCERNING CONSERVATION OF THE
HOHE MARK FOREST MASSIF AND OF THE
HIGH VALLEYS OF THE SCHWALM AND ITS
TRIBUTARIES AT ELSENBORN,**
Liege Univ. (Belgium). Dept. of Botany.
For primary bibliographic entry see Field 06G.
W73-04523

**PRINCIPLE OF MAXIMUM ENTROPY IN
HYDROLOGIC FREQUENCY ANALYSIS,**
Lagos Univ. (Nigeria). Dept. of Civil Engineering.
For primary bibliographic entry see Field 07C.
W73-04531

**THE OHIO STATE UNIVERSITY VERSION OF
THE STANFORD STREAMFLOW SIMULA-
TION MODEL: PART I - TECHNICAL
ASPECTS,**
Ohio State Univ., Columbus. Dept. of Civil En-
gineering.
For primary bibliographic entry see Field 02A.
W73-04542

**THE OHIO STATE UNIVERSITY VERSION OF
THE STANFORD STREAMFLOW SIMULA-
TION MODEL: PART II - THE COMPUTER
PROGRAM,**
Ohio State Univ., Columbus. Dept. of Civil En-
gineering.
For primary bibliographic entry see Field 02A.
W73-04543

**THE OHIO STATE UNIVERSITY VERSION OF
THE STANFORD STREAMFLOW SIMULA-
TION MODEL: PART III - USER'S MANUAL,**
Ohio State Univ., Columbus. Dept. of Civil En-
gineering.
For primary bibliographic entry see Field 02A.
W73-04544

4B. Groundwater Management

**ELECTROMAGNETIC PULSE SOUNDING FOR
SURVEYING UNDERGROUND WATER,**
Ohio State Univ., Columbus. Water Resources
Center.
For primary bibliographic entry see Field 07B.
W73-03912

**ELECTRICAL EARTH RESISTIVITY SURVEY-
ING IN LANDFILL INVESTIGATIONS,**
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 05B.
W73-03918

**WATER INFLOW INTO HOLE UA-1, AMCHIT-
KA ISLAND, ALASKA,**
Geological Survey, Lakewood, Colo.
For primary bibliographic entry see Field 05A.
W73-03919

**SUMMARY OF PANEL ON CARBON
ISOTOPES IN SUBSURFACE HYDROLOGY
AND THE ROLE OF PALEOCLIMATES IN
THEIR INTERPRETATION.**
For primary bibliographic entry see Field 02F.
W73-03957

WATER QUANTITY MANAGEMENT AND CONTROL—Field 04

Groundwater Management—Group 4B

THE CHEMICAL HISTORY OF SOME SPRING WATERS IN CARBONATE ROCKS,
Pennsylvania State Univ., University Park. Dept. of
Geochemistry and Mineralogy.
For primary bibliographic entry see Field 05B.
W73-03959

ISOTOPIC EXCHANGE STUDIES OF MICRONUTRIENTS IN SOILS,
Missouri Univ., Columbia.
For primary bibliographic entry see Field 02G.
W73-03963

SOIL HYDRAULIC CONDUCTIVITY AND BULK VOLUME CHANGES DURING CYCLIC CALCIUM-SODIUM EXCHANGE,
California Univ., Berkeley.
For primary bibliographic entry see Field 02K.
W73-03965

THE EFFECT OF THE ENTRAPPED AIR ON THE HYSTERESIS CURVES OF A POROUS BODY AND ON ITS HYDRAULIC CONDUCTIVITY,
Agricultural Research Council, Cambridge (England). Unit of Soil Physics.
For primary bibliographic entry see Field 02G.
W73-03969

ANION EXCLUSION EFFECTS ON CHLORIDE MOVEMENT IN SOILS,
Kentucky Univ., Lexington.
For primary bibliographic entry see Field 02K.
W73-03973

DETERMINATION OF A WATER TABLE IN A SOIL PROFILE USING THE PLATINUM OXYGEN CATHODE,
Department of Agriculture, Ferntree Gully (Victoria). Scoresby Horticultural Research Station.
For primary bibliographic entry see Field 02G.
W73-03985

BRUCINE ANALYSIS FOR HIGH NITRATE CONCENTRATIONS,
Arctic Health Research Center, Fairbanks, Alaska.
For primary bibliographic entry see Field 05A.
W73-04000

THERMAL POLLUTION OF GROUND WATER BY ARTIFICIAL RECHARGE,
Illinois State Water Survey, Warrenton.
For primary bibliographic entry see Field 05B.
W73-04038

STUDIES OF THE INFLUENCE OF LAGOONS AND LANDFILLS ON GROUNDWATER QUALITY,
South Dakota State Univ., Brookings. Water Resources Research Inst.
For primary bibliographic entry see Field 05B.
W73-04066

HYDROLOGIC REGIMEN OF LOWER TONTO CREEK BASIN, GILA COUNTY, ARIZONA—A RECONNAISSANCE STUDY,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 03B.
W73-04099

GROUND-WATER LEVELS IN THE SOUTH PLATTE RIVER VALLEY OF COLORADO, 1968-72,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 07C.
W73-04211

INTEGRATION OF THE AGRICULTURAL DEMAND FUNCTION FOR WATER AND THE HYDROLOGIC MODEL OF THE PECOS BASIN,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 06D.
W73-04277

THERMAL AND MINERAL SPRINGS IN THE SOUTHERN ROCKY MOUNTAINS OF CANADA,
Department of the Environment, Ottawa (Ontario). Water Management Service.
R. O. van Everdingen.
Information Canada, Ottawa, 1972. 151 p.

Descriptors: *Thermal springs, *Geothermal studies, *Rocky Mountain region, *Canada, Water temperature, Water quality, Chemical analysis, Geology, Hydrogeology, Aquifer characteristics, Geochemistry, Water chemistry, Data collections, Groundwater movement.
Identifiers: *Alberta (Canada), *British Columbia (Canada).

During 1967 and 1968, a survey of the more important springs in the southern Rocky Mountains of Canada was undertaken by the Inland Waters Branch. The best-known groups of thermal springs in this area are those at Banff and Miette in Alberta, and near Radium and Fairmont in British Columbia. These springs form a tourist attraction of major importance, partly on the basis of their reputedly healthful qualities. A description is given of each of the springs investigated, including the results of the tests and analyses made in the field and the laboratory. A discussion of seasonal variations in temperature, chemical composition and total dissolved solids concentration included in the descriptions of the four major spring areas. On the basis of what is known about the structure and the lithology of the various spring areas, an attempt was made to determine the probable origin of the spring discharge, the path of migration, the source of the mineral content, and the cause of the elevated temperatures. Carbon and sulfur isotope ratios reflect the influence of bacterial processes on the composition of many of the spring waters. (Woodard-USGS)
W73-04363

ELEVATION CHANGES DUE TO TIDES, LONG BEACH, CALIF.,
Long Beach Dept. of Oil Properties, Calif.

D. S. Kunitomi.
Journal of the Surveying and Mapping Division, American Society of Civil Engineers, Vol 98, No SU2, Paper 9315, p 137-143, November 1972. 5 fig, 6 ref.

Descriptors: *Land subsidence, *Tidal effects, *California, *Withdrawal, Compaction, Monitoring, Tides, Water level fluctuations, Subsidence.
Identifiers: *Long Beach (Calif.).

In Long Beach, California, daily changes in elevation are due to compaction and expansion of the upper 400 ft to 700 ft of the earth. It is suggested that changes in intergranular pressure due to the daily tidal cycle apply and relax elastic stress to sand grains resulting in surface elevation changes ranging from 0.002 ft to 0.010 ft. Variations in rates of water withdrawal from nearby water wells on drilling Island Chaffee substantially increase elevation changes at that location. (Knapp-USGS)
W73-04369

WATER SUPPLY FOR THE NUCLEAR ROCKET DEVELOPMENT STATION AT THE U.S. ATOMIC ENERGY COMMISSION'S NEVADA TEST SITE,
Geological Survey, Washington, D.C.
R. A. Young.

Available from GPO, Washington, DC 20402 - Price \$1.25. Geological Survey Water-Supply Paper 1938, 1972. 19 p, 2 fig, 4 tab, 12 ref.

Descriptors: *Water supply, *Groundwater resources, *Nuclear reactors, *Nevada, Water yield, Water quality, Water wells, Aquifer characteristics, Transmissivity, Specific capacity, Hydraulic conductivity, Groundwater potential, Water utilization, Hydrologic data.

The Nuclear Rocket Development Station, in Jackass Flats, occupies about 123 square miles in the southwestern part of the U.S. Atomic Energy Commission's Nevada Test Site. The only important water-producing unit known in the vicinity is a welded-tuff aquifer, the Topopah Spring Member of the Paintbrush Tuff, which receives no significant recharge. This member contains about 500 feet of highly fractured rock underlying an area 11 miles long and 3 miles wide in western Jackass Flats. Transmissivity, obtained from pumping tests, ranges from 68,000 to 488,000 gallons per day per foot. Volume of the saturated part of the aquifer is about 3.5 cubic miles, and the average specific yield probably ranges from 1% to 5%. The volume of groundwater in storage is probably within the range of 37-187 billion gallons. This large amount of water should be sufficient to supply the needs of the Nuclear Rocket Development Station for many years. Dissolved solids range from about 230 to 890 mg/liter. Water is used for public supply, construction, test-cell coolant, exhaust cooling, and thermal shielding during nuclear reactor and engine testing, and washdown. (Woodard-USGS)
W73-04370

WATER TABLE FLUCTUATIONS UNDER FOREST AND PASTURE IN A KARSTIC REGION OF SOUTHERN AUSTRALIA,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Soils.
For primary bibliographic entry see Field 02F.
W73-04374

A NEW SPECIES OF PARASTENOCARIS (CRUSTACEA, COPEPODA) OF THE HYDROIC GROUND WATER OF THE LISCIA RIVER (SARDINIA), (IN ITALIAN),
Rome Univ. (Italy). Institute di Zoologia.
For primary bibliographic entry see Field 05C.
W73-04378

GROUND WATER RECONNAISSANCE IN THE ARGHANDAB RIVER BASIN NEAR KANDAHAR, AFGHANISTAN,
Geological Survey, Washington, D.C.
E. A. Sammel.
Geological Survey Open-file Report, December 1971. 94 p, 2 fig, 12 ref, 2 append.

Descriptors: *Groundwater resources, *Aquifer characteristics, *Water yield, *Water quality, *Foreign projects, Hydrologic properties, Hydrogeology, Geology, Water resources development, Water utilization, Irrigation, Withdrawal, Water level fluctuations, Groundwater recharge, Water balance, Evapotranspiration, Chemical analysis, Surface waters, Data collections.
Identifiers: *Kandahar (Afghanistan).

During the summer of 1971 a U.S. Geological Survey team carried out a reconnaissance of groundwater conditions over an area of 1,500 square kilometers in southern Afghanistan near Kandahar. Although water levels over much of the area are generally high, 2 to 5 meters below land surface, the low hydraulic conductivities typically found (1 to 3 m per day) preclude large-scale development of groundwater from shallow wells. Information from 23 drilled wells suggests, however, that a large potential for development of

Field 04—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B—Groundwater Management

groundwater exists in the deeper alluvium. Annual recharge to the groundwater reservoir is estimated to be of the order of 530,000 acre-feet. Although this estimate is approximate, annual withdrawals from wells could be greatly increased over the present 31,000 acre-feet. Groundwater in the area is dominantly of sodium chloride sulfate type. Although measured concentrations of dissolved solids are as high as 10,000 mg/liter most groundwater contains less than 2,000 mg/liter dissolved solids and is suitable for irrigation, if good land-use practices are followed. (Woodard-USGS) W73-04379

CALCULATION OF DISCHARGE FROM PARTIALLY PENETRATING WELLS IN WATER TABLE AQUIFERS IN ISOTROPIC AND ANISOTROPIC SOILS (DETERMINATION DU DEBIT DES PUIFS INCOMPLETS DE NAPPES LIBRES FONCES EN TERRAIN ISOTROPE ET ANISOTROPE),

Universite Federale du Cameroun, Yaounde. Lab. of Hydraulics and Fluid Mechanics.

D. Le Gourières.

International Association of Hydrological Sciences Bulletin, Vol 17, No 3, p 301-313, October 1972. 1 fig, 4 tab, 10 ref, 2 append.

Descriptors: *Water yield, *Darcys law, *Water table, Groundwater movement, Equations, Isotropy, Anisotropy.

Darcy's law and a hypothesis formulated from experimental considerations were used to establish a semiempirical formula for the calculation of the discharge of partially penetrating wells sunk in isotropic soils. Starting from the previous formula, another is derived for partially penetrating wells bored in anisotropic soils. (Knapp-USGS) W73-04382

WASTEWATER RECLAMATION BY IRRIGATION,

Hawaii Univ., Honolulu. Water Resources Research Center.

For primary bibliographic entry see Field 05D.

W73-04480

GROUND WATER IN THE PLAQUEMINE-WHITE CASTLE AREA, IBERVILLE PARISH, LOUISIANA,

Geological Survey, Baton Rouge, La.

C. D. Whiteman, Jr.

Louisiana Geological Survey and Department of Public Works Water Resources Bulletin No 16, 1972. 69 p, 7 fig, 4 plate, 4 tab, 18 ref.

Descriptors: *Groundwater resources, *Water resources development, *Aquifer characteristics, *Water utilization, *Louisiana, Water yield, Water quality, Chemical analysis, Pumping, Groundwater recharge, Geology, Water wells, Water level fluctuations, Saline water-freshwater interfaces, Hydrologic data, Data collections.

Identifiers: *Iberville Parish (La.).

Abundant fresh water is available in most of the Plaquemine-White Castle area in Iberville Parish, Louisiana, from an artesian aquifer composed of deltaic and alluvial deposits of sand and gravel—the Plaquemine aquifer. Fresh water in the Plaquemine aquifer occurs to a depth of at least 400 feet beneath most of the high ground along the river, and to a maximum depth of about 550 feet in the north-central part of the area. In the southwest corner of the area salty water extends to the top of the aquifer, and little or no fresh groundwater is available. Yields of more than 1,000 gpm are common from large-diameter wells, and yields of more than 5,000 gpm have been obtained without utilizing the full capability of the aquifer. Specific capacities of large-diameter wells range from 6 to 150 gpm per foot of drawdown. Static water levels in wells fluctuate in response to changes in Mississ-

ippi River stage. Highest water levels are about 15 feet above land surface, and lowest levels are about 25 feet below land surface. Pumpage has not significantly affected water levels. (Woodard-USGS) W73-04502

WATER RESOURCES OF UNION PARISH, LOUISIANA,

Geological Survey, Baton Rouge, La.

J. L. Snider, A. J. Calandro, and W. J. Shampine. Louisiana Geological Survey and Department of Public Works Water Resources Bulletin No 17, 1972. 68 p, 6 fig, 2 plate, 11 tab, 15 ref.

Descriptors: *Water resources development, *Water utilization, *Groundwater resources, *Surface waters, *Louisiana, Pumping, Water yield, Aquifer characteristics, Streamflow, Flow rates, Water quality, Chemical characteristics, Geology, Base flow, Hydrologic data, Data collections, Flood data, Water level fluctuations.

Identifiers: *Union Parish (La.).

Large amounts of groundwater and surface water are available in Union Parish, Louisiana. The Sparta Sand of Eocene age underlies all the parish and is the most important aquifer. Wells with specific capacities as high as 10 gallons per minute per foot of drawdown can be developed in this unit at most places. Fresh water in the Sparta is of the sodium bicarbonate type, is soft, and has a pH that ranges from 7.3 to 8.9. Concentrations of chloride and sodium increase to the east. Locally, chloride, iron, fluoride, and color may be present in amounts higher than the recommended limits for drinking-water standards. The Ouachita River is the largest source of surface water in Union Parish. The average discharge is about 17,000 cfs, or 12,300,000 acre-feet per year; the average minimum flow is about 500 cfs. The water is low in dissolved-solids content, but because turbidity and color are high and pH is low, treatment is needed to make the water satisfactory for public-supply use. (Woodard-USGS) W73-04503

WATER RESOURCES OF OUACHITA PARISH, LOUISIANA,

Geological Survey, Baton Rouge, La.

J. E. Rogers, A. J. Calandro, and M. W. Gaydos. Louisiana Geological Survey and Department of Public Works Water Resources Bulletin No 14, 1972. 118 p, 14 fig, 5 plate, 8 tab, 40 ref.

Descriptors: *Water resources development, *Water utilization, *Groundwater, *Surface waters, *Louisiana, Pumping, Water yield, Aquifer characteristics, Water quality, Chemical analysis, Streamflow, Flow rates, Geology, Topography, Lakes, Water level fluctuations, Hydrologic data, Data collections.

Identifiers: *Ouachita Parish (La.).

Both groundwater and surface water are used in Ouachita Parish, Louisiana, and although development is extensive, present use constitutes only partial development of the potential of the sources. Pumpage from the Sparta Sand, the principal groundwater source, is about 15 to 18 mgd for industrial, municipal, and domestic uses. About 340 mgd of surface water, principally from the Ouachita River and Bayou Bartholomew, is pumped for industrial, municipal, livestock, and irrigation uses. Most of the surface water is used for industrial cooling and, consequently, is available for further use. The quality of water from the aquifers and streams in Ouachita Parish may change with locality, with depth of the producing sand, or with time. At a few localities the chloride content of water from the alluvium is as high as 1,800 mg/liter. Pumping stations on the Ouachita River and Bayou Bartholomew pump water at rates as much as 50,000 gpm. Water quality of tributary streams varies with flow, and in some

streams chloride and dissolved solids are excessively high at low flows. (Woodard-USGS) W73-04504

METHODS FOR THE CALCULATION OF TRUE FORMATION FACTORS IN THE BUNTER SANDSTONE OF NORTHWEST ENGLAND,

Birmingham Univ. (England). Dept. of Geology and Geophysics.

For primary bibliographic entry see Field 02F. W73-04534

CONSTRUCTION OF WASTE-INJECTION MONITOR WELLS NEAR PENSACOLA, FLORIDA,

Geological Survey, Tallahassee, Fla.

For primary bibliographic entry see Field 05E. W73-04536

4C. Effects on Water of Man's Non-Water Activities

EFFECTS OF PROPOSED RUNWAY EXTENSIONS AT LAGUARDIA AIRPORT ON TIDES, CURRENTS, SHOALING, AND DYE DISPERSION,

Army Engineer Waterways Experiment Station, Vicksburg, Miss.

For primary bibliographic entry see Field 08B. W73-04096

THE URBAN CLIMATE,

Kentucky Univ., Lexington. Dept. of Geography. R. McCoy.

Proc. available from Office of Research and Engineering Services Publications, College of Eng., Univ. of Kentucky, Lexington 40506. In: Proceedings of Symposium on Urban Rainfall Management Problems, April 17-18, 1972, Kentucky University: Lexington, Kentucky University Technical Report UKY 51-72-CE16, p 1-7, June 1972. 2 fig, 2 tab, 3 ref.

Descriptors: *Climatology, *Urban hydrology, *Urbanization, Conferences, Air pollution effects, Air temperature, Precipitation (Atmospheric), Weather.

Identifiers: *Urban climatology.

Three factors associated with cities account for most of the observed climatic differences compared with nearby rural area. These factors are: alteration of natural surfaces, internal heat production of cities, and change of composition of the urban atmosphere. Alteration of natural surfaces includes the obvious physical change from a relatively smooth surface to a surface that is aerodynamically rough. The main effects of increased roughness are reduction of wind speeds and localized increases of wind turbulence. The added turbulence may contribute to an increase of precipitation in cities. The natural surface is also altered in terms of the composition of materials. The change from vegetated surface to one of concrete and asphalt produces changes in specific heats present at the location, increases heat storage capacity, and provides fewer evaporative surfaces for cooling. Activities within a city are frequently heat producing. Furnaces, both residential and industrial, internal combustion engines, and thermal electric power plants each contribute to a high concentration of heat in a city from sources that are not usually present in rural areas. A wide variety of gases, including sulfur oxides, nitrogen oxides, carbon dioxide, and water vapor are added to the atmosphere. Particles may affect temperature by blocking incoming solar radiation. Particles, by acting as condensation nuclei, are the major factor contributing to in-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

creases in cloudiness, fog, haze, and precipitation in urban areas. (Knapp-USGS)
W73-04355

RAINFALL AND RUNOFF IN URBAN AREAS—A CASE STUDY OF FLOODING IN THE PIEDMONT OF NORTH CAROLINA.

Geological Survey, Raleigh, N.C.

A. L. Putnam.

Proc. available from Office of Research and Engineering Services Publications, College of Eng., Univ. of Kentucky, Lexington 40506. In: Proceedings of Symposium on Urban Rainfall Management Problems, April 17-18, 1972, Kentucky University: Lexington, Kentucky University Technical Report UKY 51-72-CE16, p 46-72, June 1972, 22 fig.

Descriptors: *Urban hydrology, *Rainfall-runoff relationships, *Flood forecasting, *North Carolina, Peak discharge, Runoff forecasting, Floods, Conferences, Urban runoff, Storm runoff, Urbanization, Flood control.

Identifiers: Charlotte (NC), Durham (NC), Lenoir (NC), Morganton (NC), Winston-Salem (NC).

During urbanization of a basin, flood problems are intensified. As land space is developed, more and more buildings are constructed in the low-lying areas along creeks and rivers. This construction constricts the waterway and places valuable property in reach of flooding. At the same time streets, parking lots, roofs, curbs and gutters, storm sewers, and other features that tend to increase runoff or speed it to a stream are built. Stream channels, particularly at bridges and culverts, which were adequate to handle storm runoff before development are now undersized, and buildings which were high and dry before are now subject to inundation at frequent intervals. Streams seem to go completely wild. Probably the most striking change is that associated with the time required for streamflow to respond to rainfall. Basin lag time is an index for this variable. Urban development can reduce lag time to one-fourteenth of its value for natural conditions. Coupled with this effect is the increase in the volume of water that becomes runoff during a given rain. In five cities in North Carolina (Charlotte, Durham, Lenoir, Morganton, and Winston-Salem) data were analyzed, and methods of forecasting the magnitude of future floods were developed, based on the extent of urban development. (Knapp-USGS)
W73-04356

RAINFALL AND RUNOFF IN URBAN AREAS: THEORY AND PREDICTION,

Kentucky Univ., Lexington. Dept. of Agricultural Engineering.

C. T. Haan, and B. J. Barfield.

Proc. available from Office of Research and Engineering Services Publications, College of Eng., Univ. of Kentucky, Lexington 40506. In: Proceedings of Symposium on Urban Rainfall Management Problems, April 17-18, 1972, Kentucky University: Lexington, Kentucky University Technical Report UKY 51-72-CE16, p 9-45, June 1972, 9 fig, 8 tab, 15 ref, 2 append.

Descriptors: *Urban hydrology, *Rational formula, *Peak discharge, *Runoff forecasting, Conferences, Urban runoff, Storm runoff, Urbanization, Roads, Rainfall-runoff relationships, Runoff coefficient.

It is difficult to describe the effects of urbanization on the hydrology of an area because of the many different types and degrees of urbanization. Spacious subdivisions with septic tanks can significantly increase water table levels and low flow in streams if the water supply is brought from outside the basin. This type of development may have no appreciable effect on storm flows. Dense residential developments which have a high frac-

tion of the total area in streets, roads, and sidewalks may greatly increase flood flows. Urbanization also tends to increase the frequency of flood because intense storms of short duration can produce large peak flows. The traveltime of water through the basin is shortened by street gutters, storm sewers, and channel improvements. In the rational formula, increased flood flows are shown by increase of the runoff coefficient and decrease of the time of concentration. Considerable care and judgement must be used when applying the rational equation to estimating peak runoff. The location of impervious areas with respect to the design point can greatly affect runoff rates. This is a method predicting peak flows only. For some design situations, it is necessary to be able to estimate runoff volumes. (Knapp-USGS)
W73-04357

EROSION SEDIMENT PRODUCTION,

Kentucky Univ., Lexington. Dept. of Agricultural Engineering.

For primary bibliographic entry see Field 02J.
W73-04358

URBAN EROSION—PRACTICAL ALTERNATIVES,

Soil Conservation Service, Ann Arbor, Mich.

For primary bibliographic entry see Field 04D.
W73-04359

INTERCEPTION OF RAIN BY FOREST VEGETATION—ESTIMATION OF DAILY INTERCEPTION USING A MATHEMATICAL MODEL (INTERCEPTION DE LA PLUIE PAR LA VEGETATION FORESTIERE—ESTIMATION DE L'INTERCEPTION JOURNALEIRE A L'AIDE D'UN MODELE MATHEMATIQUE),

Institut Royal Meteorologique de Belgique, Brussels.

For primary bibliographic entry see Field 02A.
W73-04530

4D. Watershed Protection

WATER PERMEABILITY OF FROZEN SOIL IN CONNECTION WITH ANTIEROSION CONSERVATION TILLAGE OF FALL-PLOWED SOIL ON SLOPES, (IN UKRAINIAN),

For primary bibliographic entry see Field 02G.
W73-03916

SOME FEATURES OF THE MOUNTAIN STEPPE SOILS OF TRANS-ILI AND DZHUNGANIAN ALA-TAU IN CONNECTION WITH EROSION (IN RUSSIAN),

For primary bibliographic entry see Field 02G.
W73-04281

URBAN EROSION—PRACTICAL ALTERNATIVES,

Soil Conservation Service, Ann Arbor, Mich.

B. E. Boesch, and C. A. Eacker.

Proc. available from Office of Research and Engineering Services Publications, College of Eng., Univ. of Kentucky, Lexington 40506. In: Proceedings of Symposium on Urban Rainfall Management Problems, April 17-18, 1972, Kentucky University: Lexington, Kentucky University Technical Report UKY 51-72-CE16, p 96-107, June 1972, 2 ref.

Descriptors: *Urban hydrology, *Erosion control, *Urbanization, *Sediment control, Sedimentation, Conferences, Soil erosion, Construction, Check structures, Cover crops, Land management, Slope protection, Soil conservation, Vegetation establishment, Water control.

Identifiers: *Urban erosion.

In urbanization, critical sediment problems occur between the appearance of earth-moving machines on the site and the completion of the development. The first step is often to strip the natural vegetation from the land and level the site. Then the subsoil is left exposed to rainfall and running water. In the Detroit metropolitan area, in the summer of 1968, 2.1% of the urban zone was under development. This part produced nearly the same amount of eroded soil material as the undisturbed 97.9% of the area. Erosion from the developing areas averaged 69 tons per acre per year, compared with an overall rate for the metropolitan area of about 3.0 tons, and an overall average rate for southeast Michigan of 2.6 tons. To control erosion, natural vegetation should be retained and protected. Where inadequate vegetation exists, temporary or permanent vegetation should be established. The exposed area should be limited to the smallest practical size for the shortest practical time. Permanent vegetation and improvements such as streets or storm sewers should be installed as early as possible. Sediment basins should be constructed. Diversions, grassed waterways, grade stabilization structures, and similar measures should be installed as early as possible. (Knapp-USGS)
W73-04359

REPORT OF THE CHIEF OF ENGINEERS TO THE SECRETARY OF THE ARMY ON A STUDY OF STREAMBANK EROSION IN THE UNITED STATES.

For primary bibliographic entry see Field 06E.
W73-04473

SEDIMENTATION—ANNOTATED BIBLIOGRAPHY OF FOREIGN LITERATURE FOR 1969 AND 1970, SURVEY NO 7.

For primary bibliographic entry see Field 02J.
W73-04507

05. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification of Pollutants

WATER INFLOW INTO HOLE UA-1, AMCHITKA ISLAND, ALASKA,

Geological Survey, Lakewood, Colo.

W. C. Ballance, and W. A. Beetem.

Available from NTIS, Springfield, Va 22151 Price \$3.00 printed copy; \$0.95 microfiche. Geological Survey Report USGS-474-156 (Amchitka-34), December 1972. 31 p, 4 fig, 3 tab, 7 ref. AEC Contract AT (29-2)-474.

Descriptors: *Groundwater, *Deep wells, *Nuclear explosions, *Chemical analysis, *Alaska, Water quality, Water pollution, Water temperature, Groundwater movement, Inflow, Data collections, Concrete placing, Grouting, Drilling, Drill holes, Thermal pollution.

Chemical composition of water samples, temperature of inflow water, and theoretical calculations were compared to evaluate the water-contributing intervals to the zone to be mined—1,782.8 to 1,798.6 m—in hole UA-1, Amchitka Island, Alaska. Hole UA-1 was constructed by the Atomic Energy Commission (AEC) for the purpose of testing an underground nuclear device. The U.S. Geological Survey evaluated the geology and hydrology of the site under agreement with the AEC. Chemical composition and temperature of inflow water indicated the contributing zones to have a mean depth of 1,670 m and 1,726.7 m, respectively. An unrestricted inflow rate based on these data was calculated to be 380 cu m per day. Samples of water pumped between June 13-23, 1970, were analyzed. Additional samples collected from October 22 to November 24, 1970, after grouting,

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification of Pollutants

were also analyzed. Chloride is the most reliable constituent to use as an indicator, as it is least affected by drilling-fluid contamination, organic oxidation, or mineralogic reactions. The samples analyzed during October and November show little change from earlier samples, which indicates the same source for the water flowing into the cavity. (Woodard-USGS)
W73-03919

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 9-11. COLORADO RIVER BASIN TO PACIFIC SLOPE BASINS IN CALIFORNIA.
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-03924

HYDROGRAPHIC OBSERVATIONS IN TAMPA BAY, FLORIDA—1969.

National Marine Fisheries Service, St. Petersburg Beach, Fla., Gulf Coast Fisheries Center.
C. H. Saloman, and J. L. Taylor.
Available from NTIS, Springfield, Va. 22151 as COM-72-10585 - Price \$3.00 printed copy; \$0.95 cents microfiche. National Marine Fisheries Service (NOAA), Data Report 73, May 1972. 82 p. 2 fig, 9 tab, 14 ref.

Descriptors: *Water quality, Chemical analysis, Water properties, *Bays, *Florida, Water analysis, *Sampling, *Data collections, Methodology, Water temperature, Salinity, Phosphorus, Nitrogen, Hydrogen ion concentration, Dissolved oxygen, Turbidity, Light penetration, Chlorophyll. Identifiers: *Tampa Bay (Fla).

Water quality data collected for Tampa Bay, Florida, during 1969 include water temperature, salinity, total phosphorus, total Kjeldahl nitrogen, pH, dissolved oxygen, turbidity, water transparency, chlorophyll a, b, and c, astaxin and nonastaxin carotenoids, and primary productivity based on the chlorophyll a extraction. Methods of collecting and analyzing samples are described. Tables summarize data collected from 30 permanent stations by mean, range, and number of observations according to month and area. Other tables summarize the mean, range, and number of observations of samples taken daily at the laboratory dock on Boca Ciega Bay, and arm of Tampa Bay. (Woodard-USGS)
W73-03926

CONCENTRATION OF REOVIRUS AND ADENOVIRUS FROM SEWAGE AND EFFLUENTS BY PROTAMINE SULFATE (SALMINE) TREATMENT,
San Diego County Dept. of Public Health, Calif.
For primary bibliographic entry see Field 05D.
W73-03993

BRUCINE ANALYSIS FOR HIGH NITRATE CONCENTRATIONS,
Arctic Health Research Center, Fairbanks, Alaska.
J. G. Holty, and H. S. Potworowski.
Environmental Science and Technology, Vol 6, No 9, p 835-837, September, 1972, 4 fig, 3 ref.

Descriptors: *Groundwater, *Water quality, *Nitrates, Analysis, Waste water, *Analytical techniques.
Identifiers: *Brucine, Nitrate stoichiometry, Standard methods.

An observed discrepancy in nitrate concentration in groundwater samples tested by the brucine method has led to a detailed study of the relationship of this method to nitrate stoichiometry. To identify the reason for the observed discrepancy a standard curve and similar curves were developed using different times for color development to

determine if inadvertent changes in development time would result in mistaking high nitrate concentrations for lower concentrations. The results of these experiments show that without a stoichiometric equivalent or an excess of brucine over nitrate, the brucine method can lead to erroneous results. Therefore, as Standard Methods implies, one must know the approximate concentration of nitrate in a sample before analysis. (Gottschalk-Texas)
W73-04000

DETERMINATION OF HYDROCARBON RESIDUES IN WATER,

Geneva Cantonal Lab. of Chemistry (Switzerland).

E. Desbaumes, and C. Imhoff.
Water Research, Vol 6, No 8, August 1972, p 885-893. 8 fig, 1 tab, 15 ref.

Descriptors: *Water quality, Waste water, Ionization, Gas chromatography, Analytical techniques, Separation techniques, *Potable water, *Organic compounds, *Pollution identification.

A method was presented for identifying and analyzing the residues of hydrocarbons and halogen hydrocarbons in waste water and drinking water. The apparatus used consisted of a metallic column with a heating lining into which the residues of volatile hydrocarbons in the sample were swept by a clean air current. The percentage of the hydrocarbons was measured directly by flame ionization. The constituents were then identified by gas chromatography after being collected in a trap. (Murphy-Texas)
W73-04007

TRACE-METAL ANALYSIS USING ATOMIC ABSORPTION SPECTROPHOTOMETRY,

New York City Water Quality Control Office.

J. T. Egan, and G. E. Peterson.
Journal of American Water Works Association, Vol 64, No 10, Part 1, p 669-673, October 1972. 4 fig, 3 photos, 3 tab.

Descriptors: *Heavy metals, *Trace elements, Water quality control, *Analytical techniques, *Laboratory equipment, New York, Water pollution, Water supply, Intakes, Absorption, Physicochemical properties, Pollutant identification.

Identifiers: *Atomic absorption spectrophotometry, *Ben Nesis Laboratory, Water intake.

Water quality control laboratories controlling the 2 bdg water supply for New York City employ some 50 scientists conducting 400,000 analyses per year on 60 different substances, including heavy metals and trace metals. The Ben Nesis Laboratory is described, its routine operation as well as organization. Principles of atomic absorption spectrophotometry are discussed followed by an analysis of precision and detection limits. Ben Nesis procedures for analysis are presented followed by a summary of heavy metals concentrations as found in the Catskill Watershed in Esopus Creek and Ashokan Reservoir. (Oleszkiewicz-Vanderbilt)
W73-04043

MERCURY IN FISH - TOTAL CONTENT IN FRESHWATER AND MARINE FISHES (VII. (TOTAAL) KWIKGEHALTE VAN ZOET-WATEREN ZEEVissen),
Rijksinstituut voor de Volksgezondheid, Utrecht, (Netherlands).

For primary bibliographic entry see Field 05C.
W73-04044

MERCURY IN FISH - IMPORTED TINNED FISH, (IX. KWIKGEHALTEN VAN EEN AANTAL SOORTEN INGEBLIKTE VIS),
Interuniversitair Reactor Instituut, Delft (Netherlands).

For primary bibliographic entry see Field 05C.
W73-04045

MERCURY IN THE ENVIRONMENT - TECHNIQUES OF ANALYSIS (XIII. ANALYSETECHNIEKEN VOOR KWIK IN HET MILIEU),

Central Lab. TNO, Delft (Netherlands).

G. J. Van Olmeschate, and R. H. De Vos.

TNO-niuws, Vol 26, p 415-418, 1971. 2 fig, 1 tab.

Descriptors: *Analytical techniques, *Mercury, *Laboratory tests, *Neutron activation analysis, Gas chromatography, Sampling, Toxicity, *Pollutant identification.

Identifiers: *Methyl mercury, *Detection techniques, Organic mercury, Atomic absorption spectroscopy, Electron capture detector, Holland.

Findings on techniques of mercury analysis are summarized. Neutron activation analysis is recommended for total mercury determination. This technique is quick and sensitive and lends itself to automation and to routine analysis. From the viewpoint of speed, accuracy and sensitivity, flameless atomic absorption is an attractive way of determining total mercury content. For organic forms of mercury gas chromatography is recommended with the electron capture detector. This system is capable of yielding good results in routine toxicological research on mono-methyl mercury. For more fundamental research work, mass spectroscopy or emission spectroscopy is recommended, combined with gas chromatography. (Oleszkiewicz-Vanderbilt)
W73-04046

SOURCES OF ERROR AND CONFIRMATION IN THE DETERMINATION OF METHYLMERCURY RADICALS,

Stockholm Univ. (Sweden). Institutionen for Analytisk Kem.

S. Jensen.

Fisheries Research Board of Canada, Winnipeg, Manitoba, Translation Series No 1394, 1970. 7 p, 1 fig. Translated from Nordisk Hygienisk Tidskrift, Vol 50, No 2, p 85-88, 1969.

Descriptors: *Analytical techniques, *Mercury, Research equipment, Laboratories, Organic compounds, Heavy metals, Performance, *Pollutant identification, Water pollution, Biota.

Identifiers: *Methylmercury, *Sources of error.

Four laboratories in Sweden which perform methylmercury analyses with slightly different methods arrive at approximately identical values when analyzing identical samples. Sources of error which may occur during certain steps in analysis are presented. A weak acid concentration in the first (digestion) stage of analysis that would give low results. Elemental sulfur contamination or contamination with inorganic mercury can give an indication of methylmercury although it is not present. A substance lodged in the instrument, which causes the breakdown of methylmercury, can cause the equipment to give no indication of methylmercury although it is present. A scheme for confirmation of the presence of methylmercury including using Ag₂SO₄ to make the GC peak disappear, chemical change of the methylmercury to a compound with a different retention time, and mass fragmentography is presented. (Eagle-Vanderbilt)
W73-04050

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

ACTIVATION ANALYSIS OF MERCURY AND OTHER ENVIRONMENTAL POLLUTANTS IN WATER AND AQUATIC ECOSYSTEMS,
Isotopenklinika Laboratoriet, Stockholm
(Sweden).

K. Ljunggren, B. Sjostrand, A. G. Johnels, M. Olson, and G. Otterlind.
Nuclear Techniques in Environmental Pollution Symposium Proceedings, Salzburg, Austria, October 26-30, 1970, International Atomic Energy Agency, Vienna, p 373-405, February 1971. 7 fig, 7 tab, 94 ref.

Descriptors: *Mercury, *Neutron activation analysis, *Heavy metals, *Analytical techniques, Fish, *Water analysis, Water quality, Arsenic compounds, Cadmium, Pikes, Trophic level, Sediments, Predation, Water pollution sources, Hazards, *Pollutant identification.
Identifiers: Precision, Accuracy, Methylation, Methylmercury, Sweden.

The methods developed for selective activation analysis of mercury, arsenic and cadmium are identical with respect to preparation, neutron irradiation and digestion of samples. A technique is used in which the intact irradiated sample is measured nondestructively rather than by measuring the sample after chemical procedures to separate its constituents. The coefficient of variation for mercury is under 6% and for cadmium is around 3%. Mercury contents of water, fish-feeding predators and drinking water in Sweden are summarized. The mercury content of pike from near the site of a suspected source of mercury can reveal the presence of mercury pollution. Arsenic analyses on herring and cod axial muscle revealed no concentrations varying widely from 'natural' levels, although arsenic content is frequently 10-100 times higher than mercury content. Vertebrates and invertebrates along a river in southern Sweden show a general increase in cadmium content in one locality. Activation analysis has demonstrated its capacity to provide accurate and reliable concentration values for both highly contaminated samples and samples representing undisturbed natural levels. (Eagle-Vanderbilt)
W73-04051

3 - PROPYL - 5 - HYDROXY - 5 - D - ARABINO - TETRAHYDROXYBUTYL - 3 - THIAZOLIDINE - 2 - THIONE, A SPECIFIC COLORIMETRIC REAGENT FOR THE DETERMINATION OF COPPER IN WATER,
Water Pollution Research Lab., Stevenage (England).
M. J. Stiff.
Analyst, Vol 97, p 146-147, February 1972. 4 ref.

Descriptors: *Copper, *Colorimetry, *Water analysis, Heavy metals, Chemical analysis, Laboratory tests, Inhibitors, Hydrogen ion concentration, Analytical techniques, *Pollutant identification.
Identifiers: *Interference, Cyanides.

The 3-propyl homologue of 3-methyl-1-hydroxy-5-D-arabinotetrahydroxybutyl-3-thiazolidine-2-thione has been prepared and used as a reagent in the colorimetric determination of copper in water. In solution a yellow complex is formed between copper and PHTTT at pH values higher than 6. Beer's law is obeyed at concentrations of up to at least 1000 micrograms of copper per liter under the conditions used in the test. The practical lower limit for analytical purposes is 40 micrograms of copper per liter. Interference by other metals and by cyanide has been examined; inhibition of complex formation by cyanide appears to be almost quantitative. (Oleszkiewicz-Vanderbilt)
W73-04056

IRON AND SILICA IN WATER, ACID AMMONIUM OXALATE, AND DITHIONITE EXTRACTS OF SOME NORTH CAROLINA COASTAL PLAIN SOILS,
Soil Conservation Service, Raleigh, N.C.

For primary bibliographic entry see Field 02G.
W73-04088

LARGE POWER PLANT EFFLUENT STUDY (LAPPE) VOLUME 3 - INSTRUMENTATION, PROCEDURES, AND DATA TABULATIONS (1970),
Environmental Protection Agency, Research Triangle Park, N.C. Div. of Meteorology.
F. A. Schiermeyer.

Office of Air Programs Publication No. APTD-0735, January 1972. 296 p, 12 fig, 12 tab, 4 plates, 17 ref.

Descriptors: *Thermal powerplants, *Powerplants, *Effluents, *Air pollution, Sampling, Thermal pollution, Instrumentation, Analytical techniques, Meteorological data, Climatology, Temperature, Humidity.
Identifiers: *Large Power Plant Effluent Study (LAPPE), Meteorological instrumentation, Air pollutants, Data analysis.

The Large Power Plant Effluent Study (LAPPE) was initiated during 1967 in Western Pennsylvania to evaluate the extent and effects of air pollution resulting from the largest complex of coal-burning generating stations in the United States. During 1970 two series of LAPPE field experiments were conducted in an area surrounding the Homer City and Conemaugh Generating Stations; these experiments consisted of ground-based and airborne plume measurements supported by extensive meteorological observations. Part 1 of this volume describes the topography and climatology of the generating station complex, the sulfur dioxide and meteorological monitoring equipment, and experimental procedures. Part 2 presents tabulations of plant operational parameters and the air quality and meteorological data collected during 1970. (Oleszkiewicz-Vanderbilt)
W73-04121

MERCURY DETECTION BY MEANS OF THIN GOLD FILMS,

Arizona State Univ., Tempe. Dept. of Chemistry; and Arizona State Univ., Tempe. Dept. of Geology.
J. J. McNerney, P. R. Buseck, and R. C. Hanson.
Science, Vol 178, p 611-612, November 10, 1972. 1 fig, 1 tab, 11 ref.

Descriptors: *Mercury, *Analytical techniques, *Instrumentation, *Prototypes, Laboratory tests, Geochemistry, Prototype tests, Adsorption, Heavy metals, Statistical methods, *Pollutant identification.
Identifiers: *Thin gold film technique, *Carrier gas.

The adsorption of elemental mercury vapor on a thin (several hundred angstroms) gold film produces resistance changes in the film. An instrument for the detection of mercury based on this phenomenon is simple and rapid and requires no chemical separations other than passage of the vapor sample through a few standard dry filters. The instrument is portable, and the technique is directly applicable to environmental problems and geochemical prospecting. The limit of detection of the prototype instrument is 0.05 nanogram of mercury. (Oleszkiewicz-Vanderbilt)
W73-04123

ON THE STATE OF MERCURY (II) TRACES IN AQUEOUS SOLUTIONS - COLLOIDAL BEHAVIOR OF MERCURY,
Technical Univ. of Prague (Czechoslovakia).
Dept. of Nuclear Chemistry.
P. Benes.

Journal of Inorganic Nuclear Chemistry, Vol 31, No 7, p 1923-1928, July 1969. 1 fig, 4 tab, 17 ref.

Descriptors: *Mercury, *Heavy metals, *Analytical techniques, Radioisotopes, Colloids, Adsorp-

tion, Hydrolysis, Centrifugation, Dialysis, Chemical precipitation, Radioactivity techniques.
Identifiers: Ultrafiltration, Electromigration.

The state of radioactivity labelled traces of bivalent mercury (3×10^{-10} to the minus 8th power moles/l) in aqueous solutions was studied by the method of centrifugation, ultrafiltration, dialysis and electromigration. In the nitrate solutions which have not been specifically purified from chlorides and have pH values 0-2 the trace mercury exists in the form of molecular HgCl_2 . At higher pH values hydrolysis of mercury occurs so that molecular mercury (II) hydroxide is the main mercury species in the freshly prepared solutions with pH 4-13. Pseudocolloidal particles of mercury are formed in the aged solutions at pH 2-7 and 12-14, probably due to the adsorption of mercury on and/or the coprecipitation with foreign impurities in the solution. (Oleszkiewicz-Vanderbilt)
W73-04126

ELECTROCHEMICAL OXYGEN DEMAND SYSTEM,

Honeywell, Inc., Minneapolis, Minn. (assignee).
J. P. Cummings, and R. E. Berg.
U. S. Patent No 3,676,321, 6 p, 7 fig, 1 tab, 2 ref;
Official Gazette of the United States Patent Office, Vol 900, No 2, p 673, July 11, 1972.

Descriptors: *Patents, *Organic wastes, Oxygen, Electrolysis, *Acidity, Water quality, Water pollution control, Electrochemistry, *Oxygen demand, Pollutant identification.

Identifiers: *Electrolytic techniques, *Chemical treatment.

An electrolytic technique provides for determination of organic waste products in water samples. It involves the use of a continuous voltage scan non-exhaustive technique. A transmission or flow chamber is provided with three electrodes, an indicating electrode, a reference electrode and a common electrode. The sample is acidified before passing into the flow chamber. A low current is passed between the common and reference electrodes. Hydrogen gas is evolved from one electrode and oxygen from the other. The oxygen content of the sample may be determined by noting the value of the voltage when the current increases rapidly in the negative direction. (Sinha-OEIS)
W73-04147

QUANTITATIVE DETERMINATION OF NITRILOTRIACETIC ACID AND RELATED AMINOPOLYCARBOXYLIC ACIDS IN INLAND WATERS: ANALYSIS BY GAS CHROMATOGRAPHY,

Monsanto Co., St. Louis, Mo.
C. B. Warren, and E. J. Malec.
J. Chromatogr. Vol 64, No 2, p 219-237, 1972. Illus.
Identifiers: Acids, Amino acids, *Gas chromatography, Effluents, Rivers, Sewage, *Nitrilotriacetic acid, *Inland waters, Pollutant identification, Analytical techniques.

Quantitative methods were developed for detecting nitrilotriacetic acid (NTA) iminodiacetic acid (IDA), N-methyl-iminodiacetic acid (NMIDA), glycine (GLY), sarcosine (SARC), and N-oxallyliminodiacetic acid (N-oxalyl-IDA) in a variety of water samples and N-nitroso-iminodiacetic acid (N-nitroso-IDA) in river water. NTA, NMIDA, and N-oxalyl-IDA were converted to their corresponding n-butyl esters; IDA, GLY, and SARC were converted to N-trifluoroacetyl n-butyl ester derivatives; N-nitroso-IDA was converted to the N-trifluoroacetyl n-butyl ester derivative of IDA. These volatile derivatives were separated and analyzed on an ethylene glycol adipate gas chromatographic column. For quantitative analysis, the amount of each amino acid injected was 3-200 ng, and the amount of each amino acid separated from the water sample was 0.25 to 1000 micro-

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification of Pollutants

gram. Response values for NTA, IDA, NMIDA, GLY, and SARC were reproducible and showed no statistical bias for river water sample concentrations of 20-0.025 mg/l. Relative standard deviations ranged from 8-13%. The response value for N-nitroso-IDA varied with concentration but was reproducible at any given concentration. Each or all of the above amino acids could be detected in samples of river water, well water, water containing nitrate ions, water containing formaldehyde, primary sewage effluent, and secondary sewage effluent.—Copyright 1972, Biological Abstracts, Inc.

W73-04183

MEASUREMENT OF SUSPENDED SOLIDS CONCENTRATIONS IN SEWAGE BY USE OF A DEPOLARIZATION METHOD

Newark Coll. of Engineering, N.J. Dept. of Civil and Environmental Engineering.

J. W. Liskowitz, and G. J. Franey.
Environ Sci Technol. Vol 6, No 1, p 43-47. 1971. Illus.

Identifiers: Measurement, Sewage, *Suspended solids, *Depolarization, Pollutant identification.

The depolarization of back-scattered polarization radiation was used to measure the concentration of suspended solids in sewage. The effect of such factors as variations in the particle size of the suspended solids, solids density, color of the samples, refractive index of the medium, sample flow, and coated optical windows of the sample cuvettes on the relationship between the degree of depolarization and suspended solid concentration was investigated. The results indicate that this relationship is unaffected by the above factors for a limited number of meaningful samples.—Copyright 1972, Biological Abstracts, Inc.

W73-04183

PERCHLORATE DETERMINATION BY THERMOMETRIC ENTHALPY TITRATION

Pennsylvania State Univ., University Park. Dept. of Chemistry.

P. W. Carr, and J. Jordan.
Analytical Chemistry, Vol 44, No 7, p 1278-1281, June 1972. 2 fig, 3 tab, 18 ref.

Descriptors: *Volumetric analysis, Chemical analysis, Enthalpy, Chemical precipitation, Automation, Kinetics, Pollutant identification, Automatic control.

Identifiers: *Perchlorates, *Direct injection enthalpymetry, *Thermometric enthalpy titration, Heats of reaction.

A simple and convenient procedure (Direct Injection Enthalpymetry) for the rapid and convenient quantitative analysis of perchlorate at millimolar concentration levels involves a precipitation titration to a thermometric end point using an organo-arsenic reagent, and is readily amenable to automation. Direct Injection Enthalpymetry provides an exploratory tool for determining heats of reaction and discriminating between slow and fast kinetics. Although only the automation of titrant addition and titration curves were utilized, even more complete automation (i.e., digital readout of the end point) is readily feasible using appropriate derivative electronic circuits. (Byrd-Battelle)

W73-04230

TITRIMETRIC MICRODETERMINATION OF ZINC WITH EDTA USING 1,5-DI-BETA-NAPHTHYLTHIOCARBAZONE (HNDZ) AS AN EXTRACTIVE INDICATOR

Delhi Univ. (India). Dept. of Chemistry.

S. K. Sindhwani, and R. P. Singh.
Zeitschrift fur Analytische Chemie, Vol 259, No 4, p 286, May 1972. 1 ref.

Descriptors: *Volumetric analysis, *Zinc, *Aqueous solutions, Heavy metals, Separation

techniques, Color reaction, Chlorides, Bromides, Iodides, Phosphates, Sulfates, Fluorides, Manganese, Calcium, Strontium, Magnesium, Copper, Pollutant identification, Cations, Anions, Chemical reactions.

Identifiers: *EDTA, *Metal complexes, *1,5-Di-beta-naphthylthiocarbazone, Precision, Sensitivity, Thiosulfates, Borates, Thiocyanates, Tartrates, Sulfites, Chromates, Oxalates, Barium, Chemical interference, Detection limits.

which includes sources and effects of, and possible solutions to existing pollution problems; various aspects of the problem of oil pollution at sea; specific pollution indicator organisms; and techniques for detecting and measuring movements of oil spills including remote sensing techniques. (Byrd-Battelle)

W73-04237

THE INSTABILITY OF OCEAN POPULATIONS, Institute for Marine Environmental Research, Plymouth (England).

For primary bibliographic entry see Field 05C.
W73-04240

INEXPENSIVE MERCURY-SPECIFIC GAS CHROMATOGRAPHIC DETECTOR

National Environmental Research Center, Cincinnati, Ohio. Analytical Quality Control Lab.

J. E. Longbottom.

Analytical Chemistry, Vol 44, No 6, p 1111-1112, May 1972. 4 fig, 12 ref.

Descriptors: *Instrumentation, *Gas chromatography, *Laboratory equipment, *Mercury, Chemical analysis, Heavy metals, Trace elements, Sediments, Pollutant identification.

Identifiers: *Mercury detector, *Organomercury compounds, Precision, Detection limits, Sensitivity, Dimethyl mercury, Diethyl mercury, Dipropyl mercury, Dimethyl mercury, Ultraviolet absorbance, Environmental samples.

The Coleman Model 50 Mercury Analyzer System, designed specifically for use with the Hatch and Ott (1968) wet chemical method for determining total mercury, has been adapted for use as a mercury-specific gas chromatographic detector. The instrument consists of a pump that draws vapor through a 15-cm cell where UV absorbance is continuously monitored at 254 nm. The system is very sensitive for elemental mercury but requires the prior reduction of all mercury to the elemental state. A modification of this detector allowed detection of as little as 0.02 ng of dimethyl mercury. Replicate injections of 5- μ g amounts of diethyl mercury were reproducible, with a relative deviation of 1.72 percent. The linear range of the instrument extends through three orders of magnitude. For diethyl mercury the detector response is linear from 0.05 ng through 100 ng. Since as little as 0.02 ng of dimethyl mercury can be detected from a gas chromatograph with the MAS-50, concentrations of 1-10 ng/liter can be detected in environmental samples. Extracts of natural water samples have shown them to be completely free of interferences. The detector system has also been applied to the detection of methyl mercury in sediment samples. Although not sensitive enough to serve in place of the electron capture detector in the analysis for the halides of methyl mercury, it has been used to confirm the presence of methyl mercury at levels of 0.010 microgram or higher, and may have a direct application to fish analyses. (Holoman-Battelle)

W73-04242

SURVEY OF ANALYTICAL SPECTRAL DATA SOURCES AND RELATED DATA COMPILATION ACTIVITIES

National Bureau of Standards, Washington, D.C., Office of Standard Reference Data.

L. H. Gevantman.

Analytical Chemistry, Vol 44, No 7, p 30A-48A, June 1972. 30 ref.

Descriptors: *Analytical techniques, *Automation, *Spectroscopy, *Surveys, Infrared radiation, Mass spectrometry, X-ray diffraction, Nuclear magnetic resonance, Ultraviolet radiation, Data collections, Data processing, Data transmission, Data storage and retrieval, Computer programs, Computers.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

Identifiers: *Spectral data sources, Atomic absorption spectrophotometry, NMR spectra, Ultraviolet spectra, Mass spectra, Molecular spectroscopy, Infrared spectra.

Those areas of spectral analysis where emphasis has been placed on the compilation and evaluation of the numerical data extracted from the literature are discussed, and the handling systems are reviewed with emphasis on how they may be used to provide the answers constantly in demand. The spectral data compilation activities described include not only the fully automated data compilation and evaluation center which issues a variety of data products, but also the efforts of some scientific groups that are beginning to define the data needs in a specific area. Sources for infrared spectra, mass spectrometric data, atomic absorption data, x-ray diffraction data, NMR spectral data (chemical shift), ultraviolet spectra, and others are described. New initiatives for automation and easy access and retrieval in some spectral areas are considered. (Byrd-Battelle)

W73-04244

STUDIES ON VARIANTS OF BACILLUS STEAROTHERMOPHILUS STRAIN NCA 1518, Missouri Univ., Columbia. Dept. of Food Science and Nutrition.

R. D. Humbert, A. DeGuzman, and M. L. Fields. Applied Microbiology, Vol 23, No 4, p 693-698, April 1972. 2 tab, 16 ref.

Descriptors: *Pollutant identification, *Biological properties, *Thermophilic bacteria, Bacteriophage, Fermentation, Cultures, Nutrient requirements, Oxygen requirements, Spores, Mathematical studies, Regression analysis, Heat resistance.

Identifiers: *Bacillus stearothermophilus, Mutants, Mutation, Biochemical tests.

The heat resistance, fermentation reactions, nutritional requirements, and phage sensitivity of 18 selected morphological variants of *Bacillus stearothermophilus* NCA 1518 were studied by standard bacteriological procedures. It was found that when smooth variants mutated to rough colonial morphology, there was no concurrent change in fermentation reactions, nutritional requirements, or heat resistance. The smooth variant, and the rough mutants derived directly from it, presented a uniform pattern of biochemical capabilities which differed from the pattern presented by the rough variants isolated from the same stock culture. This led to the conclusion that the smooth and rough types previously observed in stocks of *B. stearothermophilus* NCA 1518 either were carried in the stock since the original isolation or represent a very profound and uncommon mutation, or that one of the variants has been introduced into the stock culture from an extraneous source sometime in the past. (Long-Battelle)

W73-04246

EFFICIENCY OF SALMONELLA ISOLATION FROM MEAT-AND-BONE MEAL OF ONE 300-G SAMPLE VERSUS TEN 30-G SAMPLES, Eastern Regional Research Lab., Philadelphia, Pa. C. N. Huhtanen, J. Naghski, and E. S. Dellamonica.

Applied Microbiology, Vol 23, No 4, p 688-692, April 1972. 3 tab, 7 ref.

Descriptors: *Salmonella, *Isolation, Cultures, Foods, Analytical techniques, *Sampling, Statistical methods, Enteric bacteria, Incubation, Pathogenic bacteria.

Identifiers: Biological samples, Sample preparation, Method validation, Agars, Somatic antisera, Bone meal, Meat, Culture media.

Sample sizes of 25 or 30 grams have been recommended for isolating *Salmonella* from food samples. In this work it is shown that compositing of

several of these smaller samples into one large sample is feasible and will result in a considerable saving of labor and time with little loss of efficiency. Twenty-five meat and bone samples were obtained from rendering plants and each was thoroughly mixed into an approximate 650-g sample. A 300-g sample was removed and placed in a 4000-ml beaker, ten 30-g samples were placed in 8-oz jars, and ten 3-g samples were placed in test tubes. A selenite-cystine broth was added to the samples, and they were incubated at about 37°C for approximately 24 hr. The incubated samples were then mixed and streaked onto Brilliant Green agar plates. Presumptive colonies were then picked from these plates and used for slide agglutination studies using grouped and individual somatic antisera. Of the 25 samples, 17 were positive using the large sample, and 18 were positive using the small sample. The 300-g sample showed a significantly higher percentage of confirmed salmonellae at 2 days of incubation than at 1 day. The ten 30-g samples did not show changes at 2 days. Of 1,417 presumptive colonies picked, 1,215 were lysine decarboxylase-positive and 1,152 were agglutinated by one of the somatic antisera. There were no significant differences in diversity or total numbers of different somatic groups between the large and small samples. (Mortland-Battelle)

W73-04247

A HIGH-SELECTIVE TITRATION METHOD FOR DETERMINING COPPER WITH 2,2'-BICINCHONIC ACID (IN RUSSIAN), Chuvash State Univ., Cheboksary (USSR).

V. N. Tikhonov. Zhurnal Analiticheskoi Khimii, Vol 27, No 4, p 673-677, April 1972. 3 fig, 4 tab, 3 ref.

Descriptors: *Copper, *Volumetric analysis, Heavy metals, Selectivity, Photometry, Cations, Color reaction, Chemical reactions, Chemical precipitation.

Identifiers: *2' 2' bicinchoninic acid, *Metal complexes, Detection limits, Chemical interference.

A photometric method has been suggested for titrating copper with a solution of 2,2'-bicinchoninic acid based on the formation of a violet complex of Cu (I) with bicinchoninic acid. The method is highly-selective (other cations do not interfere) and rapid (one titration takes 5-6 min). The determinable minimum is 0.025-0.2 g. (Holoman-Battelle)

W73-04248

ANALYSIS OF TURBIDITE CORRELATION IN CASCADIA BASIN, NORTHEAST PACIFIC OCEAN, Washington Univ., Seattle. Dept. of Oceanography.

For primary bibliographic entry see Field 05B.

W73-04249

SOME OBSERVATIONS ON THE REDUCTION OF 2,3,5-TRIPHENYLtetrazolium CHLORIDE BY ESCHERICHIA COLI, For primary bibliographic entry see Field 05B.

W73-04250

AN ATOMIC ABSORPTION METHOD FOR CATION MEASUREMENTS IN KJELDAHL DIGESTS OF BIOLOGICAL MATERIALS, California Univ., Berkeley. Environmental Physiology Lab.

H. Sanui, and B. M. Mandarano. Analytical Biochemistry, Vol 47, No 1, p 57-65, May 1972. 3 fig, 3 tab, 14 ref.

Descriptors: *Cations, *Methodology, Sulfates, Phosphates, Sodium, Potassium, Magnesium, Calcium, Alkaline earth metals, Chemical analysis.

Identifiers: *Biological materials, *Atomic absorption spectrophotometry, *Kjeldahl procedure,

Chemical digestion, Kjeldahl nitrogen, Biological samples, Liver, Animal tissues, Sample preparation, Chemical recovery, Absorbance.

A practical method is described for the accurate measurement of Na, K, Mg, and Ca in Kjeldahl digests of biological samples, based on the characteristics of sulfate interference with those cations as measured by atomic absorption spectrophotometry. This could also be used for the measurement of total nitrogen. (Holoman-Battelle)

W73-04251

NEW, DIRECTLY DIGITAL AUTOMATIC TITRATION APPARATUS, Indiana Univ., Bloomington. Dept. of Chemistry.

For primary bibliographic entry see Field 07B.

W73-04252

IMPROVED PROCEDURE FOR IDENTIFICATION OF GROUP D ENTEROCOCCI WITH TWO NEW MEDIA,

Pittsburgh Univ., Pa. Dept. of Microbiology and Epidemiology.

W-S. Lee.

Applied Microbiology, Vol 24, No 1, p 1-3, July 1972. 2 tab, 8 ref.

Descriptors: *Pollutant identification, *Pathogenic bacteria, *Streptococcus, Enteric bacteria, Fermentation, Methodology, Isolation, Biochemistry.

Identifiers: *Culture media, Identification, *Group D enterococci, Streptococcus durans, Streptococcus sanguis, Streptococcus faecalis, Streptococcus faecalis var. liquefaciens, Streptococcus faecalis var. zymogenes, Streptococcus faecium, Streptococcus bovis, Streptococcus mitis, Streptococcus salivarius, Pfizer medium, Tyrosine decarboxylase medium, D-broth, Substrate utilization, Precision,

Streptococcus sanguis.

With the use of Pfizer selective enterococcus medium as a screening process, tyrosine decarboxylase (TD) medium and D-broth were devised for additional confirmation of the identification group D enterococci. The semisolid TD medium was used in a method similar to inoculating a motility tube. TD activity was indicated by clarification of the medium near the line of inoculation because the insolubility of tyrosine provided an otherwise milky suspension. D-broth was used to show the tolerance of organisms to 6.5 percent NaCl at pH 8.2. In addition, enterococcal species (except *Streptococcus durans*) could also be demonstrated by the acid formation due to the fermentation of mannitol or arabinose. With this improved system, about 97 percent of enterococci could be accurately identified and confirmed. (Long-Battelle)

W73-04253

EFFECT OF THE SOIL MOISTURE CONTENT ON THE MOBILITY OF IRON AND MANGANESE (IN RUSSIAN), For primary bibliographic entry see Field 02G.

W73-04255

DIFFERENCES OF BACTERIAL GROUPS OF NUTRIENT MEDIA IN THE DETERMINATION OF GERM GROUPS IN WATER (IN GERMAN), Mainz Univ. (West Germany). Hygiene Institut.

F. Selenka, and R. Meissner.

Arch Hyg Bakteriol. Vol 154, No 5, p 488-499, 1971. Illus. English summary.

Identifiers: Aeromonads, Bacterial studies, Enterobacteriaceae, Germ groups, Indicators, *Myxobacteria, Nutrients, *Potable water.

Depending on the type of agar culture medium used, deviations in the colony counts of drinking water and in the spectrum of species grown on this

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification of Pollutants

medium are observed. Five commercially available, dry culture media were tested: 2 yeast-extract peptone media, 2 meat-extract peptone media and meat-extract peptone gelatine. The greatest difference in colony counts obtained by these media reached the factor 17. Enterobacteriaceae were found in all 5 media in a comparable amount. Mycobacteria could be detected with the highest yield on meat-extract peptone agar which is rich in nutritive substance, while for aeromonads a meat-extract peptone agar gave the best results. In assessing the colony counts of drinking water culture media should be used which permit a development of waste water microorganism indicators to visible colonies after 2 day incubation at 22 C. Enterobacteriaceae, aeromonads and mycobacteria can be regarded as indicators in this context.—Copyright 1972, Biological Abstracts, Inc.

W73-04257

INCIDENCE OF PSEUDOCATE BACTERIA IN A POLLUTED STREAM,
Washington Univ., Seattle. Dept. of Microbiology.
For primary bibliographic entry see Field 05B.
W73-04265

A METHOD OF COLLECTING PERiphyton IN LENTIC HABITATS WITH PROCEDURES FOR SUBSEQUENT SAMPLE PREPARATION AND QUANTITATIVE ASSESSMENT,
Victoria Univ. (British Columbia).
For primary bibliographic entry see Field 02L.
W73-04270

RADIOCARBON IN THE SEA,
Washington Univ., Seattle. Dept. of Chemistry.
For primary bibliographic entry see Field 05B.
W73-04292

SHALLOW-WATER STRONTIUM-90 ANOMALY ABOUT THE ANTILLES ARC-1970,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05B.
W73-04293

STRONTIUM-90 IN THE GREAT LAKES: CONCENTRATION-TIME MODEL,
Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
A. Lerman.
Journal of Geophysical Research, Vol 77, No 18, p 3256-3264, June 20, 1972. 4 fig, 2 tab, 21 ref.

Descriptors: *Assay, *Strontium, *Great Lakes, *Model studies, Hydrologic models, Mixing, Turbidity, Radioisotopes, Watersheds (Basins), Discharge (Water), Seasonal, Stratification, Unsteady flow.
Identifiers: *Concentration-time model.

Concentration-time models for Sr-90 in the Great Lakes deal with transient concentrations of a radionuclide in a chain of mixed lakes and in a chain of periodically stratified lakes. In the model, the lakes receive time-dependent input of Sr-90 from atmosphere and land (0 to 10% of annual deposit in the land drainage basins). Removal of Sr-90 from lake water is by outflow and decay. In the five Great Lakes computed concentrations of Sr-90 rise from nil (assumed) in 1953 to a maximum in 1964 to 1965, followed by a gradual decline until 1969. Computed concentrations are comparable to the range of reported values. However, a closer agreement between the model and reported concentrations requires the rates of input in 1962 to 1964 to be higher than the mean, as well as the rates of removal to be faster (by 6 to 8%) than the removal by decay and mean outflow. Seasonal stratification of the lakes has virtually no effect on mean annual concentrations of Sr-90. (Houser-ORNL)

W73-04296

RADIOLOGICAL PHYSICS DIVISION ANNUAL REPORT, ENVIRONMENTAL RESEARCH, JAN.-DEC. 1971, Argonne National Lab., Ill.

J. R. Kline, A. J. Colon, S. S. Brar, M. L. Stewart, and C. F. Jordan.
Available from NTIS, Springfield, Va., as ANL-7860 (Pt. 3); \$6.00 in paper copy, \$0.95 in microfiche. Report ANL-7860 (Pt. 3), Dec. 1971. 314 p.

Descriptors: *Tritium, *Fallout, *Puerto Rico, *Radioactivity effects, Radioecology, Food chains, Public health, Path of pollutants, Aquatic environment, Aquatic algae, Radioactivity techniques, Analytical techniques, Vegetation effects, Soil water movement, Soil-water-plant relationships, Aquatic animals, Absorption, Thermal pollution, Calibrations, Meteorology, Heated water, Nuclear powerplants, Heat budget.
Identifiers: Cesium radioisotopes.

A freeze-drying method was developed for tritiated-water analysis in environmental samples. Cs137 was extracted from water by an ion-exchange system. Cs137 in Puerto Rican soils and vegetation increased in areas where rainfall was high and vegetation gave high aerosol interception. Tritium movement in soil agreed with predictions by the Argonne model. Tritiated water was used as a tracer for measurements of transpiration and biomass in coniferous forests. Tritium uptake in simple aquatic food chains (including algae, tadpoles, and snails) showed that the bound tritium content of animals feeding on tritiated algae was of the same magnitude as that of their food, but that there was a 3-10 fold discrimination against HTO-derived tritium. (See W73-04304 thru W73-04306) (Bopp-ORNL)
W73-04303

DETERMINATION OF SELECTED TRACE ELEMENTS IN NATURAL WATER SAMPLES USING SPARK SOURCE MASS SPECTROSCOPY,

Argonne National Lab., Ill.
M. A. Wahlgren, D. N. Edington, and F. F. Rawlings.
In: Report ANL-7860 (Pt. 3), Radiological Physics Division Annual Report, Jan.-Dec. 1971, p 55-63. 4 tab, 5 ref.

Descriptors: *Water analysis, *Trace elements, *Mass spectrometry, *Lake Michigan, Electrodes, Carbon, Instrumentation, Technology, Path of pollutants, Water pollution control, Monitoring, On-site investigations, Sampling, Preservation, Reliability, Standards, Water pollution sources, Pollutant identification, Chemical analysis.
Identifiers: Spark Source Mass Spectroscopy.

With graphite electrodes, Co was masked by the ion CaF⁺; As, by CaCl⁺; and Hg volatilized during the initial electrode sparking. Twenty-one other trace elements were analyzed. Relative sensitivity coefficients were determined using an available set of standards in a graphite matrix; re-determination using spiked water samples would probably improve accuracy. A single sampling of tributaries to the Lake Michigan South Basin and Green Bay regions gave high trends in industrialized regions, but a rigorous interpretation would require additional data, and improvements in methods. The limit of detection of a large number of trace elements was 0.1 micrograms/liter. (See also W73-04303) (Bopp-ORNL)
W73-04304

ENVIRONMENTAL CHEMISTRY: GRAND RIVER STUDIES, Argonne National Lab., Ill.

For primary bibliographic entry see Field 05B.
W73-04305

RADIONUCLIDES IN LAKE MICHIGAN FISH, Argonne National Lab., Ill.

D. M. Nelson, G. P. Romberg, and W. Prepejchal. In: Report ANL-7860 (Pt. 3), Radiological Physics Division Annual Report, Jan.-Dec. 1971, p 141-150. 1 fig, 3 tab, 4 ref.

Descriptors: *Fish, *Radioactivity, *Lake Michigan, *Nuclear wastes, Food chains, Nuclear powerplants, Path of pollutants, Bioindicators, Zinc radioisotopes, Absorption, Crayfish, Public health, Water pollution effects, Water pollution control, Monitoring.
Identifiers: Cesium radioisotopes.

In order to provide baseline data needed to evaluate any additional radioactive releases, fish samples were collected from Lake Michigan during 1970-1971 and analyzed for gamma ray emitting radionuclides. The Cs137 content of certain fish (those with limited range) near the Big Rock Nuclear Reactor (a 70-MW boiling water reactor completed in 1962) was about double that near the Point Beach Nuclear Reactor (a 480-MW pressurized water reactor completed in 1970). The Cs134/Cs137 ratio was not high enough to support a recent station contribution of greater than 20% to the total Cs137 concentration, except in a small number of bass and trout samples; however Zn65 was detected, which is more straightforwardly attributable to the Big Rock station. A diet of 100 grams/day of fish with the highest radioactivity of those caught would contribute 0.3% of the maximum recommended daily intake. (See also W73-04303) (Bopp-ORNL)
W73-04306

ENVIRONMENTAL SURVEILLANCE AT HANFORD FOR CY-1971, Battelle-Pacific Northwest Labs., Richland, Wash.

P. E. Bramson, and J. P. Corley.
Available from NTIS, Springfield, Va., as rpt. BNWL-1683. \$3.00 paper copy, \$0.95 microfiche. Report BNWL-1683, Aug. 1972. 67 p, 17 fig, 18 tab, 20 ref, 3 append.

Descriptors: *Nuclear powerplants, *Radioactivity, *Air pollution, Water pollution, *Water pollution sources, *Soil contamination, Radioisotopes, Assay, Monitoring, Regulation, Standards, Control, Public health.
Identifiers: *Surveillance program.

The 1971 Hanford Environmental Surveillance Program showed continued compliance of the Hanford contractors and their operations with applicable environmental standards. The shutdown of the last of the single-pass cooled production reactors (K) in January 1971, eliminated the major remaining source of radioactivity released off-site and of population exposure from Hanford operations. No unusual releases occurred that could cause Concentration Guides, as given in AEC Manual Chapter 0524, Appendix, Table II, to be exceeded. All measurements of radioactivity outside the plant boundaries were less than 15% of the applicable Concentration Guides. Radiation dose estimates for population groups in the plant environs for 1971 were less than 1% of applicable standards for plant operations. Offsite measurements of other air and water quality parameters were also well within applicable criteria and showed no significant evidence of plant operations. (Houser-ORNL)
W73-04310

IODINE-129 IN THE ENVIRONMENT AROUND A NUCLEAR FUEL REPROCESSING PLANT, Office of Radiation Programs, Washington, D.C. Field Operations Div. P. J. Magno, T. C. Reavey, and J. C. Apidianakis. October 1972. 23 p, 1 fig, 7 tab, 12 ref, 1 append.

Descriptors: *Nuclear powerplants, *Nuclear wastes, *Effluents, *Air pollution, *Water pollution, *Radioactivity, *Iodine radioisotopes, Water pollution sources, Food chains, Public health, Analytical techniques, Assay, *New York.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

Identifiers: *Fuel reprocessing plants, *Iodine-129, *West Valley (NY).

The specific activity of iodine-129, i.e., the ratio of the activity of iodine-129 to the weight of stable iodine, was measured in the environment around the Nuclear Fuel Services' reprocessing plant, West Valley, N.Y., during the summer of 1971. These measurements showed that the discharges of iodine-129 from Nuclear Fuel Services produced specific activities as high as 0.62 microcurie/g of iodine in the aqueous environment and 0.28 microcurie/g of iodine in the terrestrial environment around the plant. These values are about 10,000 times greater than background levels. The average specific activity of iodine-129 in the environment around the plant was 0.1 microcurie/g of iodine or 7 percent of the specific activity which if present in the human thyroid would result in the individual dose limit specified by the Federal Radiation Council. The results of this study indicated a need for control of iodine-129 discharges from nuclear fuel reprocessing plants and surveillance programs to evaluate the environmental buildup of this radionuclide. Analytical procedures for determination of iodine-129 by neutron-activation analysis and by liquid-scintillation counting are included. (Houser-ORNL)

W73-04311

OBSERVATIONS OF RADIORUTHENIUM AND RADIOCERIUM ISOTOPIC ACTIVITY RATIOS IN RAIN WATER,
Radiation Center of Osaka Prefecture, Osaka (Japan).

T. Mamuro, T. Matsunami, and A. Mizohata.
Annual Report of the Radiation Center of Osaka Prefecture, Vol 12, p 13-14, 1971. 1 fig, 2 ref.

Descriptors: *Nuclear explosions, *Civil defense, *Nuclear engineering, *Underground, Atmosphere, Air pollution, Rain water, Radioactivity, Radioisotopes, Assay, Fallout, Measurement. Identifiers: *Ruthenium, *Cerium.

It has been predicted on the basis of the results of observations carried out during 1970, that the nuclear debris injected into the stratosphere by the Chinese nuclear explosion of October 14, 1970, would become noticeable in rainwater abruptly in the first months of 1971 and thus high values of the radioruthenium and radiocerium isotopic activity ratios would be observed again. It was confirmed that the isotopic activity ratios increased abruptly in February 1971 and thus the prediction was realized. The influence of the nuclear debris released from venting from an underground explosion carried out at Nevada on December 18, 1970 was also clearly detected in this observation. (Houser-ORNL)

W73-04313

FALLOUT PROGRAM. QUARTERLY SUMMARY REPORT, JUNE 1, 1972 THROUGH SEPT. 1, 1972,
New York Operations Office (AEC), N.Y. Health and Safety Lab.
For primary bibliographic entry see Field 05B.

W73-04315

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT JUNE 1, 1972 - SEPTEMBER 1, 1972 - AN APPENDIX,
New York Operations Office (AEC), N.Y. Health and Safety Lab.
For primary bibliographic entry see Field 05B.

W73-04316

THE 1971 TRITIUM SYMPOSIUM AT LAS VEGAS,
Oak Ridge National Lab., Tenn.
C. J. Barton, H. M. Butler, R. B. Cumming, and P. S. Rohwer.

Available from Supt. of Documents, US Printing Office, Wash., D.C. 20402. \$0.60 per copy. Nuclear Safety Journal, Vol 13, No 3, p 225-235, May-June 1972. 1 tab, 2 ref.

Descriptors: *Conference, *Tritium, *Administrative agencies, *Environment, *Radioactivity, *Ion transport, Hydrogen radioisotopes, Measurement, Effluents, Nuclear powerplants, Nuclear physics, Public health, Toxicity, Safety, Monitoring, Water pollution, Water pollution sources, Assay, Biology, Effects.

A 'tritium symposium' sponsored by the Western Environmental Research Laboratory of the Environmental Protection Agency and the University of Nevada at Las Vegas was held in Las Vegas August 30 to September 2, 1971. Approximately 100 papers were presented covering a broad range of topics, including tritium production, its movement in the environment, environmental release and monitoring, detection and measurement, biological effects, biokinetics, applications in biology and medicine, and health physics. Some speakers reviewed published information, but many new data were discussed by others. The symposium served a useful purpose in gathering together scientists concerned with diverse aspects of this important hydrogen isotope. All aspects of the meeting are discussed, but papers of particular interest in the field of nuclear safety are emphasized. (Houser-ORNL)

W73-04318

PHOTOCHEMICAL DEGRADATION OF SEMI-MONOMERIC ORGANIC MATTER: EFFECT ON ZN65 RELEASE,
Oregon State Univ., Corvallis.

For primary bibliographic entry see Field 05B.
W73-04319

CONCENTRATION OF C-14 IN THE TROPOSPHERE DURING 1953 TO 1971, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.

A. P. Vinogradov, A. L. Devits, and E. I.

Dobkina.

Geokhimiya, No 2, p 131-136, Feb. 1972. 1 fig, 1 tab, 24 ref. English summary.

Descriptors: *Radioisotopes, *Carbon, *Air pollution, Water pollution, *Oceans, Water pollution sources, Assay, Carbon dioxide, Measurement, Estimating, Forecasting, Projections.

Identifiers: *Troposphere.

New data up to 1971 on concentrations of radioactive carbon in tropospheric carbon dioxide are given for the period after cessation of nuclear tests in 1961 to 1962. From experimental data the average time of CO₂ molecule presence in the troposphere before passing into the ocean has been determined to be 9.9 plus minus 0.3 years. An estimation has been made that, provided no additional sources of artificial C14 are introduced into the atmosphere, the cosmic level will be reached at the end of the second decade of the 21st century. (Houser-ORNL)

W73-04323

BEHAVIOR OF CS-137 AND CE-144 IN THE SORPTION SYSTEM SEA WATER-SEDIMENT,
V. N. Schebetkovskii, and Yu. V. Kuznetsov.

Trans. from Radiokhimiya, Vol 13, No 6, p 911-913, Nov-Dec 1971. 2 fig, 2 tab, 4 ref.

Descriptors: *Sorption, *Sediments, *Clays, *Radioisotopes, *Cesium, *Sea water, *Distribution, Distribution patterns, Transmissivity, Behavior.

Identifiers: *Cerium.

The behavior of Cs-137 and Ce-144 in the sorption system seawater-sediment was investigated in the

presence of variation of the specific content of the sorbent. The sorption of Cs-137 obeys Henry's Law, which is evidence of homogeneity of the sorbate. The sorption behavior of Ce-144 reflects the presence of this microcomponent in several forms with different affinities for the sorbent; at least one type of particle is not absorbed by sea sediments. Tables and figures are given for each of the isotopes for their behavior between sea water and sediments for different types of silt. (Houser-ORNL)

W73-04324

RADIOLOGICAL SURVEILLANCE AT PRESURIZED WATER REACTORS,
Environmental Protection Agency, Cincinnati, Ohio.

For primary bibliographic entry see Field 05B.
W73-04325

SOURCES OF WATER POLLUTION ESTABLISHED BY USING A NEUTRON ACTIVATABLE TRACER,
Pennsylvania State Univ., University Park.

For primary bibliographic entry see Field 05B.
W73-04326

ACTIVATION ANALYSIS TRACE-ELEMENT STUDIES FOR MARINE BIOLOGICAL SAMPLES,
Interuniversitair Reactor Instituut, Delft (Netherlands).

J. J. M. De Goeij, V. P. Guinn, and D. R. Young.
Transactions available from American Nuclear Society, Inc., 244 E. Ogden, Hinsdale, Ill. 60521. \$25.00 per copy.

Descriptors: *Environment, *Control, *Trace elements, *Marine biology, *Pacific Ocean, *Analytical techniques, *Zinc, *Neutron activation analysis, *Assay, *Mercury, Radiochemical analysis, Elements (Chemical), Fish, Fish diets, Food chains, Public health.
Identifiers: *Selenium.

In environmental studies, the determination of various trace elements is steadily becoming more important. Neutron activation analysis can provide the requisite sensitivities of detection for many of these trace elements. Due to the high levels of induced activities from sodium, potassium, chlorine, and bromine in biological samples, interferences are severe. The elements mercury, selenium, and zinc can be satisfactorily determined in most marine biological samples via purely instrumental neutron activation analysis, in spite of these interferences. (Houser-ORNL)

W73-04327

NUCLEAR ACTIVATION ANALYSIS OF SE, AS, ZN, Cd, AND HG IN ENVIRONMENTAL MATRICES,
National Bureau of Standards, Washington, D.C.

E. Orville, T. E. Gills, and P. D. LaFleur.
Transactions available from American Nuclear Society, Inc., 244 E. Ogden, Hinsdale, Ill. 60521. \$25.00 per copy. In: Transactions of the American Nuclear Society, 1972 Winter Meeting, November 12-17, 1972, Washington, D.C., Vol 15, No 2, 1972, p 642-643. 3 ref, 1 tab.

Descriptors: *Heavy metals, *Water pollution sources, *Toxicity, *Public health, *Assay, *Analytical techniques, *Neutron activation analysis, Biocontrol, Radioactive tracer, Testing, Selenium, Arsenic, Zinc, Cadmium, Mercury.

Recently, heavy metal contamination of the environment has been recognized as a serious pollution problem. Among these metals, particular attention is being given to Se, As, Zn, Cd, and Hg because of their toxicity and their increasing use. Neutron-activation analysis has a high sensitivity

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification of Pollutants

for the determination of these elements. The most sensitive and useful (γ , gamma) reactions involve short half-lived isotopes as As, Zn, Cd, and Hg, thus requiring chemical separation of these elements from the activated matrix. Some recent methods reported for mercury and selenium separations from organic matrices use a combustion technique that does not involve any previous dissolution of the matrix. This technique has been extended. A rapid, quantitative separation for the recovery of Se, As, Zn, Cd, and Hg from different biological and environmental materials is described. (Houser-ORNL)
W73-04328

ACTIVATION ANALYSIS OF HEAVY METALS IN SURFACE WATERS USING ION EXCHANGE FILTER PAPER AND CYANIDE COMPLEXING,

Gulf General Atomic Co., San Diego, Calif.
A. M. Kolszczkowski, and W. A. Jester.
Transactions available from American Nuclear Society, Inc., 244 E. Ogden, Hinsdale, Ill. 60521. \$25.00 per copy. In: Transactions of the American Nuclear Society, 1972 Winter Meeting, November 12-17, 1972, Washington, D.C., Vol 15, No 2, 1972, p 643-644. 1 tab.

Descriptors: *Heavy metals, *Water pollution, *Water pollution sources, *Analytical techniques, *Neutron activation analysis, Monitoring, Water Filters, Ion exchange, Surface waters, Public health, Toxicity.

A technique has been developed to employ neutron activation, cyanide complexing, and ion exchange filter paper for the analysis of heavy metals in surface waters. For this technique to be useful in the routine monitoring of waters for heavy metal pollutants, it must be both simple and rapid. The major difficulty in such analysis is the interferences from other elements of less interest, particularly sodium, chlorine, bromine, and manganese. To remove these elements to obtain speed of analysis greatly complicates the procedures. Usually, only small samples are irradiated and, thus, long irradiation times are required to induce the desired activity required to detect many of the heavy metals. Another common approach involves pre-irradiation concentration of the heavy metals which increases the possibility of sample contamination and the loss of some heavy metals such as mercury. The technique has been tested using separated and composite standards of mercury, zinc, and cobalt in the 5- to 100-ppm range. Recovery percentages of 75 to 95% are currently being performed. (Houser-ORNL)
W73-04329

MEASUREMENTS OF SEA SURFACE TEMPERATURE ON THE EASTERN PACIFIC CONTINENTAL SHELF USING AIRBORNE INFRARED RADIOMETRY, AUGUST 1963 - JULY 1968,
National Marine Fisheries Service, Tiburon, Calif.
Tiburon Marine Lab.
For primary bibliographic entry see Field 07B.
W73-04352

GROUND WATER RECONNAISSANCE IN THE ARGHANDAB RIVER BASIN NEAR KANDAHAR, AFGHANISTAN,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 04B.
W73-04379

MINIATURE ON-LINE DIGITAL COMPUTER FOR MULTIPURPOSE APPLICATIONS. APPLICATIONS TO KINETIC ANALYSES,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
For primary bibliographic entry see Field 07C.
W73-04387

RAMAN SPECTRA-STRUCTURE CORRELATION FOR PYRAZINES. NEW METHOD FOR OBTAINING SPECTRA OF TRAPPED NANOLITER GAS CHROMATOGRAPH FRACTIONS,

Procter and Gamble Co., Cincinnati, Ohio. Miami Valley Labs.
R. P. Oertel, and D. V. Myhre.
Analytical Chemistry, Vol 44, No 9, p 1589-1593, August 1972. 3 fig, 2 tab, 10 ref.

Descriptors: *Gas chromatography, *Chemical analysis, Methodology, Sampling, Laboratory equipment, Instrumentation, Pollutant identification.

Identifiers: *Pyrazines, *Raman spectra, *Sample preparation, Raman spectrophotometer, Spectral analysis; Ethoxy pyrazine, Ethyl pyrazine, Isopropyl pyrazine, Methyl pyrazine, Vinyl pyrazine, Detection limits.

Raman spectra-structure correlations have been formulated (based on data for 32 pyrazines variously substituted with alkyl, alkoxy, and vinyl groups) which allow convenient, unequivocal determination of the ring-substitution pattern of pure pyrazines and, in many cases, components of a pyrazine mixture. The sample to be analyzed is collected from the exit port of the gas chromatograph in a borosilicate glass melting point tube cooled with dry ice-acetone. One end of the tube is sealed and the other end is drawn into a fine capillary according to the size of the sample. The end of the capillary is sealed, with formation of a small spherical head of glass at the end; then, the sample is distilled to the end of the capillary by heating the tube at 225°C while cooling the capillary with dry ice. The tube is then collapsed near the junction of the large diameter portion and the capillary section, trapping the sample within the capillary (free of any air gap). Experimental data obtained by this method indicate that samples of less than one nanoliter may be analyzed by this method and may be preserved for further spectrometric analysis. (Snyder-Battelle)
W73-04388

ELECTRONIC SPECTRA OF 2-AMINOQUINOLINE AND 4-AMINOQUINALDINE. EVIDENCE FOR THE CYCLIC AMIDINE STRUCTURE OF THE SINGLY PROTONATED CATIONS,

Florida Univ., Gainesville. Coll. of Pharmacy.
P. J. Kovi, A. C. Capomacchia, and S. G. Schulman.
Analytical Chemistry, Vol 44, No 9, p 1611-1615, August 1972. 3 fig, 3 tab, 26 ref.

Descriptors: *Chemical analysis, Fluorescence, Dyes, *Industrial wastes, Water pollution sources, Organic compounds, Pollutant identification.

Identifiers: *Electronic spectra, *2-aminoquinoline, *4-aminoquinaldine, Electronic absorption spectroscopy, Infrared spectroscopy, Drugs, Fluorescence spectroscopy, Chemical structure.

Electronic absorption, fluorescence, and infrared spectroscopies have been employed to show that the singly protonated (a heterocyclic nitrogen) species derived from 2-aminoquinoline and 4-aminoquinaldine have the protonated amidine electronic structures in ground and lowest electronically excited singlet states. The neutral and doubly protonated compounds, however, appear to be well behaved arylamines and arylammonium ions, respectively, in ground and lowest excited singlet states. The anomalous pKa values corresponding to ground and excited state prototropic equilibria of the 2-aminoquinoline and 4-aminoquinaldine are attributed to the relative contributions of the basicity and acidity of the amidine species and those of the acidity and basicity of the arylamine and arylammonium ion species to the overall free energy of prototropic exchange. (Byrd-Battelle)
W73-04389

RAPID SEPARATION OF METAL CHELATES BY COLUMN LIQUID-LIQUID CHROMATOGRAPHY USING ULTRAVIOLET DETECTION, Amsterdam Univ. (Netherlands). Lab. for Analytical Chemistry.

J. F. K. Huber, and J. C. Krasak.
Analytical Chemistry, Vol 44, No 9, p 1554-1558, August 1972. 8 fig, 4 tab, 18 ref.

Descriptors: *Pollutant identification, *Separation techniques, *Aqueous solutions, Chemical analysis, Chelation, Alcohols, Water pollution, Beryllium, Aluminum, Chromium, Iron, Cobalt, Nickel, Copper, Zinc, Selectivity, Heavy metals, Methodology, Water analysis.

Identifiers: *Liquid liquid chromatography, *Metal chelates, *Column chromatography, Zirconium, Rubidium, Spectrophotometric detector, Ultraviolet spectra, Acetylacetones.

The separation of metal-beta-diketonates has been accomplished by column liquid-liquid chromatography. Included in the study are the acetylacetones and the trifluoroacetylacetones of Be (II), Al (III), Cr (III), Fe (III), Co (II), Co (III), Cu (II), Zn (II), Zr (IV), and Ru (III). A ternary liquid-liquid system composed of water, 2,2,4-trimethylpentane and ethanol was employed. The water-rich phase was used as the stationary medium while the water-poor phase served as eluent. Several of these two-phase systems, varying in quantitative composition, were evaluated for chromatographic selectivity. The addition of a trace of chelating ligand to the phase system suppressed undesirable hydrolysis reaction of chelates. A six-component mixture of metal acetylacetones can be separated in less than 25 minutes. (Byrd-Battelle)
W73-04391

MICROBES AS TRACERS OF WATER MOVEMENT,

University Coll. of South Wales and Monmouthshire, Cardiff. Dept. of Microbiology.

For primary bibliographic entry see Field 05B.

W73-04392

LARGE, INEXPENSIVE OVEN USED TO DECONTAMINATE GLASSWARE FOR ENVIRONMENTAL PESTICIDE ANALYSIS,

Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.

J. G. Lamberton, and R. R. Claeys.
Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 898-899, July 1972. 1 fig 2 ref.

Descriptors: *Pesticides, *Chemical analysis, *Laboratory equipment, Heptachlor, Dieldrin, Waste dilution, Chlorinated hydrocarbon pesticides, Gas chromatography, Temperature, Water pollution, Aldrin, DDT, DDE, Solvent extractions, Polychlorinated biphenyls.

Identifiers: *Glassware, *Decontamination, Ovens, Thin layer chromatography.

The construction of a large, inexpensive oven is described for the removal of interfering contamination from glassware used in chlorinated hydrocarbon pesticide analysis. In order to determine the effectiveness of the oven, pieces of laboratory glassware that had been exposed to chlorinated hydrocarbon pesticides were baked overnight at 230°C. The glassware was then rinsed thoroughly with acetone and the resulting solution diluted with two part water and extracted with hexane. Chromatograms of the hexane solution showed the glassware contamination reduced to insignificant levels at a sensitivity of 0.01-0.05 nanogram of the pesticide. A description and diagram of the oven are included. (Byrd-Battelle)
W73-04394

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Identification of Pollutants—Group 5A

THIN LAYER CHROMATOGRAPHIC DETECTION OF CHLORINATED HYDROCARBONS AS CROSS-CONTAMINANTS IN PESTICIDE FORMULATIONS.

Environmental Protection Agency, Beltsville, Md. Pesticides Regulations Div.

W. R. Bontyan, and P. D. Jung.

Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 851-856, July 1972. 7 tab, 17 ref.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pollutant identification, Dusts, Liquids, Aldrin, Dieldrin, Endrin, DDT, Filtration, Centrifugation, Desiccants, Water pollution sources, Aqueous solutions, Pollutants, Analytical techniques, Pesticides, Chromatography.

Identifiers: *Thin layer chromatography, *Detection limits, Chlordane, Strobane, Toxaphene, Carbaryl, Malathion, Maneb, Captan, Bordeaux, Rotenone, Ferbam, Dithiocarbamate, Zincab, Parathion, Contamination.

Chlorinated hydrocarbon pesticide contamination studies are reported in which a TLC method is used to analyze a variety of dust and liquid formulations. Eight gram samples are extracted with 20 ml acetone, followed by elution with n-hexane on silver nitrate-aluminum oxide G TLC plates. Results are reported of a 4 year study, using a large collaborative sampling, in which the detection limits and utility of the described procedure were examined. The method has been adopted as official first action for the detection of contamination by 0.01 percent aldrin, dieldrin, endrin, and technical DDT and by 0.05-0.10 percent chlordane, Strobane, and toxaphene. (Byrd-Battelle) W73-04396

ANALYSIS FOR CRUDE FATTY ACIDS (TOTAL FATTY ACIDS AND UNSAPONIFIABLE MATTER) IN FEED GRADE FATS: REPORT OF THE JOINT AOAC-AOCS COMMITTEE ON THE ANALYSIS OF FEED GRADE FATS.

Purdue Univ., Lafayette, Ind. Dept. of Biochemistry.

F. W. Quakenbush.

Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 846-850, July 1972. 1 fig, 4 tab, 3 ref.

Descriptors: *Lipids, Carbon, *Separation techniques, Aqueous solutions, Water pollution, *Pollutant identification, *Solvent extractions, Vegetation, Soaps.

Identifiers: *Fatty acids, Liquid-liquid extraction, Precision, Biological materials, Sample preparation, Collaborative studies, Animal fats, Vegetable fats.

A method for analysis of total fatty acids plus unsaponifiable matter that employs a newly designed liquid-extraction apparatus has given satisfactory results in a collaborative test. Seven collaborators analyzed samples of prime tallow, chicken fat, yellow grease, 2 samples of cottonseed fatty acids, and 2 samples of acidulated soap stock. The method permits removal of hexane-soluble unsaponifiable matter as a separate fraction. The 3 animal fat samples yielded results which were close to the theoretical value, 95.6, for a triglyceride with 85 percent C18 and 15 percent C16 fatty acids. The 4 samples of hydrolyzed vegetable fats gave lower values, probably because of the presence of dark insoluble material. Nevertheless, the method seems to be acceptable for analysis of such low grade samples. The method has been adopted as official first action. (Byrd-Battelle) W73-04397

MODIFICATION OF SCHAEFER'S PROCEDURE FOR SEROTYPING OF ORGANISMS OF THE MYCOBACTERIUM AVIUM-M.

INTRACELLULARE-M. SCROFULACEUM COMPLEX,

M. Reznikov, and J. H. Leggo.

Applied Microbiology, Vol 23, No 4, p 819-823, April 1972. 4 tab, 13 ref.

Descriptors: *Mycobacterium, *Pollutant identification, Methodology, Chemical reactions, Aerobic bacteria, Cultures, Isolation.

Identifiers: *Serotyping, *Agglutination, Schaefer's procedure, Biochemical tests, Mycobacterium avium, Mycobacterium intracellulare, Mycobacterium scrofulaceum.

Modifications to the tube-agglutination procedure which Schaefer developed for serotyping 76 strains of the Mycobacterium avium - M. intracellulare-M. scrofulaceum complex are proposed and compared to the original. To determine agglutination titer, progressive dilutions of antisera (prepared from preimmunized rabbits) in phenolized phosphate buffer were added to bacterial suspensions and incubated for 20 hr at 35°C. Agglutination was read in oblique fluorescent light against a dark background, and was registered as complete, intermediate, or absence. Modifications to Schaefer's procedure reduce from 44 to 22 the number of antisera needed to be prepared and reduce by 80 percent the expenditure of antisera and bacterial suspensions of strains being determined. Bacterial suspensions to be identified are screened with unabsorbed antisera at concentrations of 4 times the titer, and those strains showing complete agglutination are retested in the appropriately absorbed antisera 4-8 times the titer prior to absorption. To determine the effectiveness of the modified procedure, 80 strains previously serotyped by Schaefer's procedure were serotyped. Comparison of the results revealed only one discrepancy. (Long-Battelle) W73-04398

STUDY OF THE METABOLIZATION OF POLLUTANT PRODUCTS,

Centre de Recherches de l'Onnem d'Asseinsissement, Colombes (France).

For primary bibliographic entry see Field 05B.

W73-04402

ALGAL ASSAY PROCEDURE,

Uppsala Univ., (Sweden). Inst. of Physiological Botany.

C. G. Forsberg.

Journal Water Pollution Control Federation, Vol 44, No 8, p 1623-1628, August 1972. 2 fig, 2 tab, 5 ref.

Descriptors: *Bioassay, *Waste water (Pollution), *Aquatic algae, *Industrial wastes, *Methodology, Pollutant identification, Photometry, Growth rates, Laboratory tests, Water pollution effects, Nitrogen, Phosphorus, Sampling, Culture, Nutrients, Euglenophyta, Chlorophyta, Incubation.

Identifiers: *Growth potential, Precision, Selenastrum capricornutum, Sample preparation, Euglena gracilis, Ankistrodesmus falcatus, Scenedesmus quadridens.

An algal assay procedure was used to determine the algal growth potential in wastewater effluents, especially those from chemical treatment plants. Selenastrum capricornutum or a group of mixed algae was placed in culture tubes containing a modified nutrient solution of Rodhe and 2.5 or 5 percent concentration of wastewater effluent. Following incubation of the algae at 24°C under fluorescent light (3,000 lux), growth in the tubes was determined photometrically and by electronic particle counting. The difference in growth or growth potential in cu mm/l between the tubes containing the effluent and the control tubes with no effluent was measured, the standard deviation for a series of 5 parallel tests was 2-3 percent. Sample tests from 7 days gave for effluent taken in

the morning an average algal-growth potential of 0.5 whereas in the afternoon a value of 1 was recorded. A very good correlation was obtained between total P and algal volume during these tests. (Long-Battelle) W73-04404

EXTRACTION OF ANIONS INTO CHLOROFORM BY SURFACTANT CATIONS. RELEVANCE TO DYE EXTRACTION METHOD OF ANALYSIS OF LONG CHAIN AMINES,

Indian Association for the Cultivation of Science, Calcutta. Dept. of Physical Chemistry.

H. K. Biswas, and B. M. Mandal.

Analytical Chemistry, Vol 44, No 9, p 1636-1640, August 1972. 4 fig, 1 tab, 11 ref.

Descriptors: *Separation techniques, *Dyes, *Spectrophotometry, *Absorption, Chemical reactions, Ions, Anions, Chemical analysis, Methodology, Equilibrium, Ion exchange, Aqueous solutions, Nitrates, Iodides, Ammonium salts, Organic compounds, Chlorides, Fluorides, Bromine, Nitrates, Solvent extractions.

Identifiers: *Amines, Acetates, Chemical interference, Perchlorates, Chloroform.

Anion interference with the analysis of long chain amines by the dye extraction method has been investigated using the anionic dye, disulfone blue VN 150. Five milliliters of a mixture of dye (.00001-.0001 mole per liter) and salt solution were equilibrated with 5 ml of cetyltrimethylammonium bromine solution in chloroform. The absorbance of the organic layer was measured and dye concentration determined spectrophotometrically. Interference occurred as a result of competition from the anions with the dye ion for extraction into the organic phase. Anions such as F (-) SO42 (-), and acetate did not interfere; however, for the anions examined the degree of interference followed the order: ClO4 (-) greater than NO3 (-) greater than Br (-) greater than NO3 (-) greater than Cl (-). This is also the order of extraction of the anions into chloroform by the ammonium ions. (Snyder-Battelle) W73-04408

VANADIUM DETERMINATION IN BIOLOGICAL MATERIALS AT NANOGRAM LEVELS BY A CATALYTIC METHOD,

Agricultural Research Service, Ithaca, N.Y. Plant, Soil and Nutrition Lab.

R. M. Welch, and W. H. Alaway.

Analytical Chemistry, Vol 44, No 9, p 1644-1647, August 1972. 1 fig, 5 tab, 19 ref.

Descriptors: *Spectrophotometry, *Chemical analysis, *Catalysis, Heavy metals, Solvent extractions, Chemical reactions, Separation techniques, Efficiencies, Chelation, Neutron activation analysis, Radioactivity techniques, Molybdenum, Grasses, Pollutant identification, Water pollution sources, Corn (Field), Legumes, Leaves, Tomatoes, Alfalfa, Chromium, Iron, Cobalt, Nickel, Manganese.

Identifiers: *Vanadium, *Biological samples, Chemical interference, Sample preparation, Detection limits, Chemical recovery, Precision, V-48, Wet ashing, Peas, Tissue, Liver, Kidneys, Muscle, Bone, Complexation, Mineral acids, Inorganic compounds.

A spectrophotometric method, based on the development of color by products produced by a V-catalyzed oxidation reaction, was used to measure V in biological materials. Biological samples were digested with nitric-perchloric acid and vanadium was separated from interfering elements by complexing with 8-quinolinol and chloroform at pH 4.0. Vanadium was then released from the complex by readjusting the pH to 9.4-9.5 with an aqueous ammonium nitrate buffer. Once separated, the V was then determined in the aqueous phase by spectrophotometrically measuring

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification of Pollutants

the production of oxidation products resulting from the V-catalyzed oxidation of gallic acid by acid-persulfate. The extraction procedure eliminated all interfering elements (Cr, Fe, Co, Ni, Mn), recoveries of 94-98 percent of the V added to plant material and 90-100 percent of V-48 added to standard V solutions were obtained. The method was sensitive to 5 ng quantities of V in biological materials and the results compared favorably with those from neutron activation analysis. (Long-Battelle)
W73-04409

INFLUENCE OF AMALGAM FORMATION ON CYCLIC VOLTAMMETRY,

Michigan State Univ., East Lansing. Dept. of Chemistry.

F. H. Beyerlein, and R. S. Nicholson.
Analytical Chemistry, Vol 44, No 9, p 1647-1650, August 1972. 4 fig, 4 tab, 8 ref.

Descriptors: *Electrodes, *Electrochemistry, *Pollutant identification, Cadmium, Sodium, Heavy metals, Aqueous solutions, Mathematical studies, Equations, Methodology, Evaluation, Testing procedures, Theoretical analysis, Alkali metals, Metals.

Identifiers: *Cyclic voltammetry, *Stripping analysis, *Amalgam, Hanging mercury drop electrodes, Reinmuth's approximation, Data interpretation, Acetonitrile.

Some discrepancy between the cyclic voltammetry theory and experimental results was noted during research involving stripping analysis and the use of hanging mercury drop electrodes. Because the theory did not include the effects of amalgam formation, calculations were attempted that included this factor. The approach of Reinmuth was used, assuming that the effects of finite electrode volume are negligible. The results of these calculations were then evaluated experimentally for reduction of cadmium in aqueous solution and sodium in acetonitrile. Excellent agreement between theory and experiment was obtained in both cases. The theory shows that the ratio of anodic to cathodic peak currents is always greater than unity and that enhanced peak potential separations occur under some conditions. (Mortland-Battelle)
W73-04410

REDUCTION OF AROMATIC FLUORINE COMPOUNDS,

University of Southern Mississippi, Hattiesburg. Dept. of Chemistry.

For primary bibliographic entry see Field 05B.
W73-04412

AUTOMATIC SORTING OF INFRARED SPECTRA,

National Biological Standards Lab., Canberra (Australia).

For primary bibliographic entry see Field 07C.
W73-04413

COMBINED ION EXCHANGE-SOLVENT EXTRACTION (CIESE) STUDIES OF METAL IONS ON ION EXCHANGE PAPERS,

Palli Siksha Sadana, Sriniketan (India). Dept. of Chemistry.

A. K. De, and C. R. Bhattacharyya.
Analytical Chemistry, Vol 44, No 9, p 1686-1688, August 1972. 3 fig, 5 tab, 18 ref.

Descriptors: *Ion exchange, *Solvent extractions, *Ions, *Heavy metals, Chromatography, Separation techniques, Resins, Cation exchange, Anion exchange, Pollutant identification, Alkali metals, Selectivity, Chemical analysis, Manganese, Iron, Cobalt, Nickel, Copper, Zinc, Aluminum, Chromium, Cadmium, Mercury, Molybdenum, Calcium, Lead, Chlorides, Cerium.

Identifiers: Synergistic effects, Tri-n-butyl phosphate, 2-Thenoyltriifluoroacetone, Paper chromatography, Vanadium, Lanthanum, Arsenic, Thallium, Gallium, Indium, Thorium, Palladium, Bismuth, Zirconium, Tantalum, Antimony, Tin, Tungsten, Plutonium, Niobium.

Amberlite SA-2 cation exchange and SB-2 anion exchange paper strips were used to study synergistic effects and chromatographic separations during combined ion exchange-solvent extraction (CIESE) studies of metal ions. Two-Thenoyltriifluoroacetone (TTA) and tri-n-butyl phosphate (TBP) were used throughout the work. Initial zones of the solutions were spotted with fine glass capillaries and the chromatographic runs were carried out in glass jars by the ascending paper chromatographic technique. Zone development was carried out by spraying with suitable reagents. Tables are presented showing the separation of metal ions on each of the two papers. The synergistic behavior of the TIA-TBP mixed solvent system using SA-2 paper for copper and cobalt is also given. Using the SB-2 paper, several oxidation states of the same metals were separated. All of the data developed seem to indicate higher selectivities that may be due to both the ion exchange and partition mechanism of CIESE. (Mortland-Battelle)
W73-04414

FLUORIDE ION ACTIVITY ELECTRODE AS A SUITABLE MEANS FOR EXACT DIRECT DETERMINATION OF URINARY FLUORIDE,

Research Inst. for Animal Nutrition, Pohorec (Czechoslovakia).

J. Tusi.

Analytical Chemistry, Vol 44, No 9, p 1693-1694, August 1972. 1 tab, 12 ref.

Descriptors: *Fluorides, *Electrodes, *Urine, Electrochemistry, Analytical techniques, Spectrophotometry, Photometry, Calibrations.

Identifiers: *Ion selective electrodes, Biological samples, Buffers, Chemical interference.

Urine samples were taken from male adults supplied with one oral 80-mg dose of sodium fluoride for analysis on an Orion Ionanalyzer Fluoride Electrode. Three milliliters of urine were diluted with water to 10 ml and mixed with 10 ml of total ionic strength adjustment buffer (TISAB) or citrate buffer before analysis. Equally diluted samples were digested at 60°C for 24 hr from HC104, and fluoride was then determined by the spectrophotometric lanthanum azarin complexonate method as a reference. Studied curves for the determination of fluoride were prepared using standards treated in the same manner as the samples. The results indicated high specificity of urinary analysis using the fluoride electrode. The use of TISAB eliminates common interferences with fluoride electrode measurements due to the presence of calcium phosphate or aluminum. The results indicated that the pretreatment of urine with perchloric acids is necessary only in unusual cases. It is suggested that fluoride electrode results should be checked periodically by diffusion and photometric analysis. (Mortland-Battelle)
W73-04415

USE OF POTASSIUM PHTHALIMIDE FOR IDENTIFICATION OF ALKYLENE BIS HALIDES AND BIS SULFONATES,

Rochester Inst. of Tech., N.Y.

C. F. Allen, and J. P. Glauser.
Analytical Chemistry, Vol 44, No 9, p 1694-1696, August 1972. 3 tab, 24 ref.

Descriptors: *Chemical reactions, *Chemical analysis, Mass spectrometry, Separation techniques, Halides, Sulfonates, Inorganic compounds, Sulfur compounds, Alkybenzene sulfonates, Organic compounds, Aromatic compounds, Potassium compounds, Chlorides, Nuclear magnetic resonance, Physical properties, Melting, Methodology, Pollutant identification.

Identifiers: *Alkylene bis sulfonates, *Alkylene bis halides, *Imides, Esters, Tetrachlorophthalimide, Dibromomethane, Aryl sulfonates, 1,2,3-trichloropropane, Hydrocarbons, 1,10-decanediol, 1,14-tetradecanediol, 2,2'-oxydiethanol, Triethylene glycol, 1,7-heptanediol, p-Toluenesulfonfyl chloride, 1,2,3,4,6-dihalides, 1,7-dibromoheptane, Pentaerythritol tetrabromide, 1,9-nonamethylene dibromide, Alkanes, Besylethane.

The chemical reaction of K phthalimide with alkylene bis halides or alkylene bis sulfonates to form imide derivatives can be used for the qualitative analysis of these alkylene compounds. Preparation of derivatives requires mixing one gram of either bis halide or bis sulfonate, two equivalents (.7 plus 0.4 gm) of K phthalimide, and 20 ml of dimethylformamide; refluxing for an hour; cooling to 100°C; adding ice and five ml of 10 percent NaOH; and stirring to remove the phthalimide present. The bis imide formed is then isolated by filtration after recrystallization. Several new bis phthalimido derivatives were isolated and their melting points (MP) are tabulated. The isolated derivatives, that were already recorded in the literature, were identified by comparison of MP, mixture MP, and by instrumental methods including IR spectroscopy and NMR spectra. The yields of recrystallized derivatives with high MP and low solubility were 46 to 57 percent. The usefulness of this procedure can be extended to diol identification by addition of a preliminary step-formation of a sulfonate ester. (Long-Battelle)
W73-04416

RELATION BETWEEN RETENTION INDICES AND BOILING POINTS OF HYDROCARBONS DIFFERING SLIGHTLY IN THEIR VAPOR PRESSURES,

Komenskeho Universita, Bratislava (Czechoslovakia). Inst. of Chemistry.

L. Sojak, J. Hrvnak, J. Krupcik, and J. Janak.
Analytical Chemistry, Vol 44, No 9, p 1701-1703, August 1972. 1 fig, 2 tab, 11 ref.

Descriptors: *Vapor pressure, *Organic compounds, Equations, Temperature, Gas chromatography, Water pollution, Pollutant identification, Kinetics.

Identifiers: *Boiling point, *Retention index, Isomers, Activity coefficients, Olefinic hydrocarbons, Alkenes, Alkanes.

Observations were made of the gas chromatographic behavior of a variety of hydrocarbons obtained with a 200 meter open tubular squalane column at various specific temperatures. A relatively small change in column temperature reversed the retention sequences of these compounds. In addition to column temperature, the proportionality constant of the relation between retention indices and boiling points for straight-chain alkenes was a function of the number of carbon atoms and the structure of the pairs of isomers. Mathematical equations expressing precisely the retention behavior of straight-chain alkenes separated on squalane were derived taking into account the differences of the activity coefficients and the temperature dependence of vapor pressure and the activity coefficients of the compared isomers. The influence of different structures of isomers on their retention times is greater, the smaller the difference between their boiling points. (Byrd-Battelle)
W73-04417

SPECIES IDENTIFICATION IN VISIBLE-ULTRAVIOLET VAPOR,

New South Wales Univ., Kensington (Australia). Dept. of Physical Chemistry.

D. S. Alderdice, and B. R. Crawford.
Analytical Chemistry, Vol 44, No 9, p 1703-1706, August 1972. 3 fig, 1 tab, 5 ref.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

Descriptors: Chemical analysis, Equations, Temperature, *Bromine, *Pollutant identification, Vapor pressure.

Identifiers: *Ultraviolet vapor spectrometry, Absorbance, Molar absorptivities, Ultraviolet spectra.

An observational procedure is presented for species identification by visible-ultraviolet vapor spectrometry. The primary features of this procedure, which may be referred to as an absorbance-temperature correlation, are as follows: (1) attainment of good thermal equilibrium between vapor and condensed phases in most cases; (2) discrimination between volatile optically absorbing species; (3) positive identification of the absorbing species by close correlation of the observed slope with known latent heat data; (4) an alternative experimental approach to the accurate determination of latent heats; (5) determination of molar absorptivity in the absence of complete vapor pressure data; and (6) a possible means of determining vapor pressure for the absorbing species. Under less than ideal experimental conditions for the identification of bromine vapor, the absorbance-temperature correlations were shown to be both meaningful and amenable to simple interpretation. (Byrd-Battelle)

W73-04418

SOME COMMENTS ON THE SIGNAL-T-NOISE CHARACTERISTICS OF REAL PHOTOMULTIPLIER AND PHOTODIODE DETECTION SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
For primary bibliographic entry see Field 07B.
W73-04419

HIGH SENSITIVITY THERMOCHEMICAL ANALYSIS,
Georgia Univ., Athens. Dept. of Chemistry.
For primary bibliographic entry see Field 07B.
W73-04420

CHROMATOGRAPHIC DETECTION OF WATER CONTAMINANTS,
Carnegie-Mellon Univ., Pittsburgh, Pa.
S. C. Caruso, and J. R. Koslow.
Industrial Water Engineering, Vol 7, No 1, p 22-26, January 1970, 8 fig.

Descriptors: *Gas chromatography, *Organic wastes, Infrared radiation, Ultraviolet radiation, Microbial degradation, Waste water treatment, Water treatment, Waste dilution, Pollutant identification.

Identifiers: *Mass spectroscopy.

The speed, resolving power, and sensitivity of gas chromatography make it especially suited for the detection, separation and analysis of organic contaminants present in surface waters. An early application of this technique was the determination of the organic compounds from an industrial waste spill which were responsible for a malodor and odor in the water. Other applications include: tracing organic compounds in rivers to their source, evaluating the efficiency of water and waste treatment systems, and determining the rate of microbiological degradation and effects of dilution. The identification of specific compounds separated by gas chromatography can be accomplished by use of infrared, ultraviolet, and mass spectroscopy. (Murphy-Texas)

W73-04423

SALMONELLA AS AN INDEX OF POLLUTION OF SURFACE WATERS,
Center for Disease Control, Atlanta, Ga.
W. B. Cherry, J. B. Hanks, B. M. Thomason, A. M. Murfin, and J. W. Biddle.
Applied Microbiology, Vol 24, No 3, p 334-340, September, 1972, 6 tab, 18 ref.

Descriptors: *Salmonellae, Surface waters, Filtration, Sampling, Cultures, Water quality, Waste water, Domestic sewage, *Pollutant identification, *Path of pollutants.

Identifiers: Cotton swabs, *Sampling techniques.

The objectives were: (1) to compare fluorescent antibody (FA) with cultural techniques for sensitivity in the detection of salmonellae in surface waters; (2) to evaluate the efficiency of two types of fiber swabs in the recovery of salmonellae from water; and (3) to determine the numbers and variety of salmonellae serotypes present in these waters. FA techniques indicated the presence of salmonellae in about 60% more specimens than did cultural techniques. Cotton gauze and rayon-polypropylene fiber swabs appeared to be equally effective in sampling water for salmonellae. Tetrathionate enriched broth incubated at 41.5°C appeared to be superior to selenite-cysteine for isolating the salmonellae. Twenty-nine serotypes of salmonellae and two serotypes of Arizona were identified in the 121 positive specimens. In water rated moderately polluted, 65% of all specimens tested were positive; in minimally polluted water, 38 percent were positive; and in unpolluted streams, 44 percent were positive. (Murphy-Texas)

W73-04426

AN EVALUATION OF PROCEDURES FOR ENUMERATING BACTERIA IN ACTIVATED SLUDGE,
Water Pollution Research Lab., Stevenage (England).

E. B. Pike, E. G. Carrington, and P. A. Ashburner. Journal of Applied Bacteriology, Vol 35, No 2, p 309-321, June, 1972, 3 fig, 5 tab, 30 ref.

Descriptors: *Activated sludge, *Flocculation, Water quality, *Bacteria, *Hydrogen ion concentration, Phosphorus compounds, Sampling, Separation techniques, Waste water treatment, *Aerobic bacteria.

Identifiers: *Spread plates.

A reliable routine procedure for counting viable heterotrophic aerobic bacteria in activated sludge, a procedure which may possibly be used at a later date to count populations of different bacteria, was sought. Samples from the works of Letchworth, Herts and Rye Meads, Essex, and from various experimental plants at the laboratory were analyzed in terms of bacteria release from sludge flocs. These experiments, recorded on graphs and tables, indicate that the most suitable routine technique for counting viable aerobic bacteria in activated sludge is the combined use of sodium tripolyphosphate diluent, Kerr homogenization and spread plating on Casitone-glycerol-yeast extract agar - with incubation for 6 days at 22 deg. (Gottschalk-Texas)

W73-04430

WATER RESOURCES OF UNION PARISH, LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 04B.
W73-04503

WATER RESOURCES OF OUACHITA PARISH, LOUISIANA,
Geological Survey, Baton Rouge, La.
For primary bibliographic entry see Field 04B.
W73-04504

ICE ANALYSES. DATA FROM THREE NORWEGIAN LAKES,
Oslo Univ. (Norway). Dept. of Limnology.
For primary bibliographic entry see Field 02C.
W73-04506

5B. Sources of Pollution

ELECTRICAL EARTH RESISTIVITY SURVEYING IN LANDFILL INVESTIGATIONS,
Illinois State Geological Survey, Urbana.
K. Cartwright, and F. B. Sherman, Jr.

In: Proceedings of 10th Annual Engineering and Soils Engineering Symposium, Moscow, Idaho, April 5-7, 1972, p 77-92, 1972, 9 fig, 1 tab, 8 ref.

Descriptors: *Water pollution sources, *Landfills, *Groundwater movement, *Tracking techniques, *Electrical resistance, Methodology, Analytical techniques, Geology, Instrumentation, Data collections, Reviews, Evaluation, Measurement, Dissolved solids, Salinity, Leachate, Soil properties, Path of pollutants.

The movement of mineralized groundwater from a refuse disposal site can be detected and traced reasonably well with electrical earth resistivity methods. Geophysical surveys are not a substitute for hydrogeologic studies, but they can be useful in the preliminary investigation and monitoring of existing landfill sites. In general, empirical interpretive techniques based on experience are reliable for interpretation of the field data. The more uniform the geologic material, both in physical properties and depth to the zone of saturation, the more likely the interpretation approximates actual conditions. Several examples of landfill monitoring are described. (Woodard-USGS)
W73-03918

SURFACE WATER MOVEMENT STUDIES UTILIZING A TRACER DYE IMAGING SYSTEM,
 Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 07B.
W73-03943

THE REMOTE SENSING OF OIL SLICKS,
Naval Research Lab., Washington, D.C.
N. W. Guinard.

In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol II, p 1005-1026, 1971, 14 fig, 3 tab, 7 ref.

Descriptors: *Remote sensing, *Radar, *Oil spills, *Path of pollutants, Data collections, Oily water, Instrumentation, Waves (Water), Oil pollution.

Radar is studied as a means to detect the area of coverage of oil spills. In the first phase of the study, two types of measurement programs were conducted. The first was the mapping of the accidental spill produced when the Tanker ARROW collided with Cerberus Rock in Chedabucto Bay, Nova Scotia, and the second was conducted over a test spill off the California coast. In both cases, imagery was acquired as a function of radar frequency, polarization, and viewing angle by the NRL Four-Frequency Radar System. A data base was collected from which the relationships between image contrast and radar variables, sea state and oil type and thickness can be obtained. Operational data can also provide guidance into the deployment and utilization of the technique. (Knapp-USGS)
W73-03944

OIL SLICK STUDIES USING PHOTOGRAPHIC AND MULTISPECTRAL SCANNER DATA,
Virginia Inst. of Marine Science, Gloucester Point.
J. C. Munday, Jr., W. G. MacIntyre, M. E. Penney, and J. D. Oberholzer.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources of Pollution

In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol II, p 1027-1043, 1971. 11 fig, 1 tab, 36 ref.

Descriptors: *Remote sensing, *Aerial photography, *Oil spills, *Path of pollutants, Oily water, Instrumentation, Spectroscopy, Data collections.

Field studies of spills of Nos. 6, 4, and 2 fuel oils and menhaden fish oil in the southern Chesapeake Bay were supplemented with aerial photographic and multispectral scanner data. Thin oil films showed best in the ultraviolet and blue bands, and thick films showed best in the green band. Color film was effective for all thicknesses. Thermal infrared imagery detected oil clearly but required field data to distinguish thickness and emissivity variations from temperature variations. Spreading rates of the slicks agree with the theory of Fay; further study of spreading is in progress. (Knapp-USGS)
W73-03945

MULTI-SENSOR OIL SPILL DETECTION, Spectran, Inc, Los Angeles, Calif.

J. C. Aukland, D. T. Trexler, and F. Orthlieb.

In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol II, p 1045-1052, 1971. 7 fig.

Descriptors: *Remote sensing, *Aerial photography, *Radar, *Oil spills, *Oily water, Oil pollution, Infrared radiation, Path of pollutants, Pollutant identification, Data collection, Instrumentation.

Data and design are discussed for an all-weather, oil pollution system capable of obtaining legal evidence for the enforcement agencies of the United States. A significant amount of data were collected for an insight into the type of sensors required for an all-weather, oil pollution detection system. The best detection of all oils tested in clear-weather conditions was by infrared scanners at 8-14 microns. Infrared scanners operating in the 8-14 micron region of the spectrum produced imagery quality much superior to that produced in the 4-5.5 micron region. The 4-lens camera operating in the short wavelength visible and ultraviolet regions shows the best detection capability of the photographic sensors. The 0.36-0.40 micron band produces the best contrast of all filters used. The effects of sun angle (glitter) degrades the detection capabilities of the longer wavelength bands. Visual color and infrared color photography appear to be equally capable of detecting oil on the surface of the water under the weather conditions experienced during performance of this program. Detection of oil slicks formed at spill rates of 0.05 gpm was possible immediately after spillage. The small flow rate dispersed rapidly and was not discernable for extended periods of time. Color photographs in the visible portion of the spectrum were superior to the infrared in inferring flow rates by sensing a wider range of colors in the thicker slicks. Microwave radiometry is recommended as a backup detection mechanism to the infrared scanner in that it can provide an all-weather, day or night requirement. (Knapp-USGS)
W73-03946

REMOTE SENSING CONSIDERATIONS FOR WATER QUALITY MONITORING, Wisconsin Univ., Madison.

J. P. Scherz.

In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol II, p 1071-1087, 1971. 10 fig, 10 ref.

Descriptors: *Remote sensing, *Monitoring, *Water quality, Water pollution control, Aerial photography, Instrumentation, Data collections, Mapping, Path of pollutants, Pollutant identification, Infrared radiation, Radar.

Imaging remote sensing, especially photography, is a valuable monitoring tool utilized by experts in the military, planimetric and topographic mapping, forestry, agriculture, soils mapping and erosion control, and various other fields. When it is so employed the users take advantage of one or more of the following features of imaging remote sensing: (1) it provides a detailed overall view from a vantage point; (2) it provides a detailed image record to be used to detect change in the area with time; and (3) it can expand the limits of the human eye and sense in parts of the spectrum where the eye cannot see. Remote sensing is a monitoring tool for water pollution control. There is one major difference however, between applying remote sensing to water monitoring as compared to applying it in other areas, that difference being how electromagnetic energy reacts with the wastes and water. Various wavelengths of the energy spectrum react in different ways with water. Short UV energy is reflected directly from the surface; some visible wavelengths penetrate quite well into the water and return from the bottom; and the longer IR wavelengths are completely absorbed. Some wavelengths are reflected at the surface and other wavelengths go deeper and return, while others do not return at all. There is a depth penetration consideration necessary in water quality monitoring which must be taken into account before proper interpretation keys can be made up and effectively utilized. (Knapp-USGS)
W73-03947

AGRICULTURALLY-POLLUTED IRRIGATION WATER AS A SOURCE OF PLANT-PARASITIC NEMATODE INFESTATION, Agricultural Research Service, Prosser, Wash. Irrigated Agriculture Research and Extension Center.

L. R. Faulkner, and W. J. Bolander.

In: Journal of Nematology, Vol 2, No 4, p 368-374, October, 1970. 2 fig, 3 tab, 5 ref.

Descriptors: *Nematodes, *Irrigation water, *Water pollution sources, Irrigation wells, Aquatic animals, Entomology, Microbiology, Alfalfa, Beans, Sugarcane, Wheat.
Identifiers: Eggplant, Mint.

Water from a major irrigation canal and water from a deep well was used to irrigate plants growing in methyl bromide fumigated greenhouse ground beds. Nematode populations in these beds were compared during three seasons of continuous cropping to alfalfa, bean, eggplant, mint, sugarbeet, or wheat. Beds irrigated with canal water became heavily infested with a variety of plant parasitic nematodes while those receiving well water did not. (Skogerboe-Colorado State)
W73-03974

THE CHEMICAL HISTORY OF SOME SPRING WATERS IN CARBONATE ROCKS, Pennsylvania State Univ., University Park. Dept. of Geochemistry and Mineralogy.

R. L. Jacobson, and D. Langmuir.
Groundwater Hydrology, Vol 8, No 3, p 5-9, May-June, 1970. 4 fig, 2 tab, 9 ref.

Descriptors: *Water quality, *Spring waters, *Carbonates, Water pollution sources, Salinity, Mineral water, Groundwater movement.
Identifiers: *Residence time.

Insight into the chemical and hydrogeologic history of spring waters in carbonate rocks was gained from a study of the chemical quality of such waters and of the waters which feed the springs. Most of the dissolved solids were added to spring waters during ground water flow. Dye tracing of

groundwater feeding springs in two drainage basins gave residence times of from 2-6 days for subsurface flows of 4000 feet. Specific conductances ranged from 180 to 476 micromhos, with a mean of 347 micromhos. (Skogerboe-Colorado State)
W73-03959

ISOTOPIC EXCHANGE STUDIES OF MICRONUTRIENTS IN SOILS, Missouri Univ., Columbia.

For primary bibliographic entry see Field 02G.
W73-03963

A COMPUTER ANALYSIS ON THE LEACHING OF BORON FROM STRATIFIED SOIL COLUMNS, California Univ., Davis.

For primary bibliographic entry see Field 02G.
W73-03967

THE CONCENTRATION OF K, CA, AND MG IN THE SATURATION EXTRACT IN RELATION TO EXCHANGEABLE K, CA, AND MG, Landwirtschaftliche Forschungsanstalt, Buenzenhof (Germany).

For primary bibliographic entry see Field 02K.
W73-03970

INFLUENCE OF VARIOUS TREATMENTS ON THE DISSOLUTION OF DICALCINIUM PHOSPHATE IN SOILS, California Univ., Riverside.

U. S. Sree Ramulu, and P. F. Pratt.
Soil Science, Vol 109, No 3, p 186-189, March, 1970. 2 tab, 16 ref.

Descriptors: *Soil chemistry, *Inorganic compounds, Organic matter, Soil management, Soil science, Anaerobic conditions, *Soil treatment.
Identifiers: *Dissolution, *Dicalcium phosphate, Preheating.

The effects of preheating, wetting and drying and of anaerobic conditions with and without addition of organic matter on the dissolution of Dicalcium phosphate dihydrate (DCPD) in three soils, were studied using phase diagrams. Preheating and/or addition of organic matter to anaerobic samples increased the rate of dissolution of DCPD added to soils whereas wetting and drying treatments increased the rate only to a limited extent. Anaerobic conditions with no organic matter had no measurable effect. (Skogerboe-Colorado State)
W73-03974

DISSOLUTION OF DICALCINIUM PHOSPHATE IN RELATION TO IRON OXIDE CONTENT OF ACID SOILS, Agricultural Coll., Coimbatore (India).

For primary bibliographic entry see Field 02K.
W73-03983

THE OCEANS HAVE BECOME THE SINKS OF THE WORLD, For primary bibliographic entry see Field 05C.

W73-03985

FINITE-DIFFERENCE CONVECTION ERRORS, Oregon State Univ., Corvallis. Dept. of Civil Engineering.

For primary bibliographic entry see Field 02E.
W73-03997

POLYCHLORINATED BIPHENYL: STILL PREVALENT, BUT LESS OF A PROBLEM, For primary bibliographic entry see Field 05C.

W73-04006

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

LOSSES OF 65 ZN TO INORGANIC SURFACES IN A MARINE ALGAL NUTRIENT MEDIUM,
Oregon State Univ., Corvallis. Dept. of Oceanography.
For primary bibliographic entry see Field 05C.
W73-04011

ADSORPTION AND CONCENTRATION OF DISSOLVED CARBON-14-DDT BY COLORING COLLOIDS IN SURFACE WATERS,
Louisiana State Univ., New Orleans. Dept. of Biological Sciences.
M. A. Poirier, B. R. Bordonel, and J. L. Laseter. Environmental Science and Technology, Vol. 6, No. 12, p 1033-1035, November, 1972. 1 tab, 15 ref.

Descriptors: *Colloids, *DDT, Pesticides, *Chlorinated hydrocarbon pesticides, Insecticides, Stability, Estuaries, Food chains, Environment, Water pollution effects, *Path of pollutants, *Adsorption.
Identifiers: *C-14-DDT, Marine food chain.

Laboratory studies were conducted to determine the degree to which coloring colloids in natural waters adsorb DDT. Water samples from a highly colored acid stream in Louisiana were mixed with a stock solution containing C-14-DDT. Determinations showed that the concentration of C-14-DDT in the coloring material was 2656 ppb by weight, which represented an increase of 15,800 times the original concentration of 0.168 ppb. The affinity of chlorinated hydrocarbons for coloring colloids, the small size of these particles, and their stability in the colloidal state could allow insecticides to accumulate in concentrations far in excess of that expected for pure water. These substances could be transported great distances to estuaries and the ocean, and there introduce DDT into the marine food chain. (Murphy-Texas)
W73-04012

INDEXED BIBLIOGRAPHY OF THERMAL EFFECTS LITERATURE - I,
Oak Ridge National Lab., Tenn. Nuclear Safety Information Center.
For primary bibliographic entry see Field 05C.
W73-04020

FORMS OF NITROGEN IN THE VOLCANIC SOILS OF SIBUNDY (IN SPANISH),
Narino Univ., Pasto (Colombia). Instituto Tecnológico Agrícola.
M. Blasco, F. Romo, O. Bastidas, and A. Caicedo. An Edafol Agrobiol. Vol 30, No 3/4, p 261-269. 1971. English summary.
Identifiers: Ammonium, *Colombia, Nitrates, *Nitrogen, Sibundy, Soils, *Volcanic soils.

As the anaerobic conditions became predominant total-N increased from 5349 ppm to 9257 ppm (swamp soils), the organic-N fraction being about 96-98% of total-N. Native fixed NH₄-N as a fraction of total-N varied from 1.15-2.21%, and exchangeable NH₄-N from 0.65-1.71%. The percentages of the organic and inorganic-N did not vary greatly with the profile depth. NH₃-N accumulation was always greater than NO₃-N accumulation. Native fixed and exchangeable NH₄-N were lower than those from other areas.—Copyright 1972, Biological Abstracts, Inc.
W73-04032

IMPACT OF COOLING WATER ON LAKE TEMPERATURES,
Minnesota Univ., Minneapolis. Dept. of Civil and Mineral Engineering; and Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
H. Stefan, C. S. Chu, and H. Wing. Journal of the Power Division, American Society of Civil Engineers, Vol 98, No 102. Paper 9241, p 253-272, October, 1972. 15 fig, 7 ref.

Descriptors: *Cooling water, *Heat, *Thermal powerplants, *Water temperature, Currents (Water), Lakes, Reservoirs, Rivers, Water pollution, *Thermal pollution, Temperature, Density, Environmental effects, Heat budget, Heating, Stratification.
Identifiers: *Waste heat, Heat rejection, Cooling systems, *Lake St. Croix.

The impact of cooling water discharge from A.S. King plant on water temperatures in Lake St. Croix during the summer of 1969 is evaluated in terms of overall effects. The information supplements previous studies of local temperature increments in the thermal plume. The method used is generally applicable and puts into focus the alteration of the elements of a natural heat budget by power plant effluents as well as illustrating some of the trade-offs between natural and artificial heat inputs and resultant temperature changes. Caution must be exerted when ambient temperatures are used to represent natural ones. The main objective was to demonstrate the applicability of the heat budget method to predict alterations of natural water temperatures caused by cooling water discharges. The particular numerical results obtained show no significant impact of cooling water discharges on water temperatures at the chosen demonstration site for the period of investigation. (Oleszkiewicz-Vanderbilt)
W73-04037

THERMAL POLLUTION OF GROUND WATER BY ARTIFICIAL RECHARGE,
Illinois State Water Survey, Warrenville.
R. T. Sasman. Water and Sewage Works, p 52-55, December 1972. 3 fig, 4 tab, 4 ref.

Descriptors: *Artificial recharge, *Heated water, *Thermal pollution, *Industrial wastes, *Groundwater, Illinois, Cooling water, Aquifers, Temperature, Recharge wells, Geology, Wells, Recirculated water, Rocks, Water yield, Water supply.
Identifiers: Temperature gradient (Groundwater).

Of the five industries in northeastern Illinois recharging cooling water, four have reported no undesirable effects. The effect on well water temperatures of one industry recharging high temperature cooling water effluent is described. The water for this industry is primarily obtained from two wells about 1350 ft. deep. The recharge well is 50 feet from one supply well and about 600 ft. deep. The temperature of farm wells as well as of the supply wells were measured and a temperature gradient away from the recharge well was found. High temperature recharge water has had a significant effect on the groundwater temperature for a distance of at least 500 feet and perhaps as far as 1000 feet. Additional consideration should be given to this problem in future operations of this type. Monitoring injection rate, water levels, temperature and quality would be beneficial in attempts to determine long range effects on ground water aquifers. (Eagle-Vanderbilt)
W73-04038

PESTICIDE REGULATIONS AND RESIDUE PROBLEMS IN JAPAN,
National Inst. for Agricultural Sciences, Tokyo (Japan). K. Fukunaga, and Y. Tsukano. Residue Reviews, Vol 26, p 1-16, 1969, 3 tab, 11 ref.

Descriptors: *Pesticide residues, *Agricultural chemicals, *Mercury, *Environmental effects, Foods, Legislation, Fisheries, Toxicity, Poisons, Rice, Hazards, Public health standards, Regulation.
Identifiers: *Residues, *Japan, Japanese laws, Mercury residues, Organometallic compounds.

There are three laws concerned with pesticides in Japan. The Agricultural Chemicals Control Law is aimed primarily at insuring the quality of pesticides and plant-growth regulators and preventing inferior products from reaching the market. Pesticides with high mammalian toxicity are further controlled by the Poisons and Deleterious Substance Control Law from the standpoint of public health. Based on the Food Sanitation Law, official pesticide tolerances are now being established. Use of organomercury fungicides for rice blast control caused the problem of mercury residues in rice. These chemicals have, however, been almost completely replaced with non-mercury fungicides in rice blast control. Several organophosphorus insecticides with high mammalian toxicity are to be eliminated from the market within a few years. Withdrawal of these poisonous pesticides and the progress of regulatory programs are expected to lay the foundation for the safe use of pesticides. Chemical pest control will be continued in Japan as a necessary means for maintaining high yields of agricultural products. (Oleszkiewicz-Vanderbilt)
W73-04042

LEGACY OF THE MAD HATTER,
Washington Univ., St. Louis, Mo. School of Medicine.
For primary bibliographic entry see Field 05C.
W73-04048

BIRDS GIVE WARNING,
Stockholm Univ. (Sweden). Dept. of Biochemistry.
For primary bibliographic entry see Field 05C.
W73-04049

STUDY OF RAINOUT OF RADIOACTIVITY IN ILLINOIS,
Illinois State Water Survey, Urbana.

Eighth Progress Report, COO-1199-18, November 1969. 49 p, 13 fig, 3 tab, 13 ref, 4 append. AEC AT (11-1)-119.

Descriptors: *Trace elements, *Rain water, *Precipitation, *Illinois, *Aerosols, *Tracers, Clouds, Raindrops, Rainfall intensity, Thunderstorms, Storm water, Metals, *Radioactivity, Air pollution, Meteorological data, Zinc, Copper.
Identifiers: *Rainouts.

An experiment is described based on release of a chemical tracer into a specific portion of a convective cloud and measurement of the aerial deposition of the chemical at the surface. A budget of tracer material was performed based on analysis of the rainwater, a meteorological analysis of the synoptic situation and knowledge of the microphysical parameters of the convective system. Some naturally occurring tracers such as metals have also been studied named ITREX after Illinois TRacer EXperiment. Trace metals studied included potassium, sodium, calcium, magnesium, copper, zinc and lithium. (Oleszkiewicz-Vanderbilt)
W73-04052

A PHYSICOCHEMICAL RATIONALE FOR THE BIOLOGICAL ACTIVITY OF MERCURY AND ITS COMPOUNDS,
Brookhaven National Lab., Upton, N.Y.
For primary bibliographic entry see Field 05C.
W73-04054

MERCURY POLLUTION,
Chemag A.G., Mannedorf (Switzerland). L. Grob. Presented at International Congress on Industrial Waste Water, Stockholm, Sweden, Butterworth, London, November 1970. 8 p.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources of Pollution

Descriptors: *Heavy metals, *Water pollution sources, Electrolysis, Electrochemistry, Pollutant identification, *Mercury.
Identifiers: *Chlor-alkali plants, Mercury sources.

Sources of mercury pollution are listed. A chlor-alkali electrolysis plant with modern cells normally has a mercury loss of 100-150 g Hg per ton NaOH. The largest mercury losses are in a general cleaning of cell rooms. About 50% or more of total mercury loss is due to the general cell room cleaning. The other mercury sources from the chlor-alkali electrolysis are: caustic soda, brine, condensates at the hydrogen cooling area, condensates at the chlorine cooling area, general cleansing water for cell floors, hydrogen, brine saturates, etc. It is possible to reduce mercury losses to 30-50 g or less, from above 100-150 g Hg per ton NaOH by good facility design and housekeeping. (Novotny-Vanderbilt)
W73-04055

FACTORS AFFECTING PLANT UPTAKE AND PHYTOTOXICITY OF CADMIUM ADDED TO SOILS,
Department of Agriculture, Agassiz (British Columbia), Research Station.
M. K. John, C. J. Van Laerhoven, and H. H. Chuah.
Environmental Science and Technology, Vol 6, No 12, p 1005-1009, November 1972. 1 photo, 5 tab, 26 ref.

Descriptors: *Cadmium, *Heavy metals, *Soil-water-plant relationships, *Plants, Iron, Zinc, Nickel, Copper, Biology, Soils, Agriculture, Lettuce, Analytical techniques, Statistical methods, Foods.
Identifiers: Assimilation, *Phytotoxicity, Radish, Extraction.

For a set of 30 surface soils, addition of 50 mg of cadmium, from CdCl₂, to 500 grams of soil reduced yields and sharply increased cadmium levels in analyzed portions of radish and lettuce plants when compared with those plants grown on control soils. For the treated soils, plant cadmium was significantly related to cadmium extracted from soil by neutral N ammonium acetate. The N HCl and N HNO₃ extractions did not indicate plant availability but removed most of the soil cadmium. From among 18 potential independent variables, stepwise linear regressions to predict cadmium found in plant parts harvested from treated soils included a measure of the relative ability of soils to adsorb cadmium, acetate-soluble cadmium in the soil, soil reaction, and organic matter as significantly contributing independent variables. Plant cadmium levels were significantly correlated with amounts of Ni, Fe, Zn, and Cu in the same plant portion. (Oleszkiewicz-Vanderbilt)
W73-04058

STUDIES OF THE INFLUENCE OF LAGOONS AND LANDFILLS ON GROUNDWATER QUALITY,
South Dakota State Univ., Brookings. Water Resources Research Inst.
J. R. Andersen.

Available from the National Technical Information Service as PB-214 138, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report, December 1972. 47 p, 12 fig, 7 tab, 5 ref. OWRR A-016-SDAK (3).

Descriptors: *Groundwater, *Waste disposal, *Water quality, *Oxidation lagoons, *Landfills, *Infiltration, Water pollution sources, *Sewage lagoons.

Groundwater contamination resulting from waste disposal was studied in the vicinity of a solid waste disposal site and at five waste water stabilization ponds. Wells were periodically sampled near the sites to determine changes that occur in water quality. Results indicated that during periods of

high groundwater table elevation, groundwater in the immediate vicinity of the refuse area would not meet U.S.P.H.S. criteria for human consumption. A trench constructed to intercept degraded groundwater flowing from the active disposal site beneficially affected the quality of the groundwater. Periodic reevaluation of the tested area to determine long-term effects of the landfill refuse site on quality of groundwater was recommended. Studies of five sewage stabilization pond sites found that: soil is effective in removing large percentages of phosphate, nitrogen, chemical oxygen demand, and bacteria from wastewater passing through it; under favorable conditions a small community may use an infiltration lagoon as an effective tertiary treatment device for nutrient removal; application of the infiltration lagoon principle is dependent upon suitable geological conditions; pollution of a shallow groundwater table can be controlled to some degree by interception trenches or tiles; and infiltration lagoons should not be used as a substitute for initial waste treatment requirements. Some impairment of water quality may occur in the vicinity of a sewage stabilization pond, however, it appears that this degradation does not constitute a major concern provided proper precautions are taken when extracting groundwater in the vicinity of the disposal site. (Wiersma-South Dakota)
W73-04066

SOLUTIONS FOR MISCELLANEOUS DISPLACEMENT OF SOIL WATER WITH TIME-DEPENDENT VELOCITY AND DISPERSION COEFFICIENTS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 02G.
W73-04040

MIXING-HEIGHT MEASUREMENT BY LIDAR, PARTICLE COUNTER, AND RAWINSONDE IN THE WILLAMETTE VALLEY, OREGON,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
M. P. McCormick, S. H. Melfi, L. E. Olsson, W. L. Tuft, and W. P. Elliott.
Available from NTIS, Springfield, Va 22131 as NASA TN D-7103 - Price \$3.00 printed copy; \$0.95 cents microfiche. Technical Note NASA TN D-7103, December 1972. 78 p, 49 fig, 1 tab, 8 ref, 3 append.

Descriptors: *Aerosols, *Water vapor, Atmosphere, Air pollution, *Mixing, Convection, Analytical techniques, *Radar, Temperature, Wind velocity, Meteorological data, Tracking techniques, Altitude, Atmospheric physics, Fallout, Water pollution sources, *Oregon, *Remote sensing, Nucleation.
Identifiers: *Mixing-height measurement, *Willamette Valley (Ore), *Lidar (Laser radar), Rawinsonde.

The feasibility of using laser radar (lidar) to measure the spatial distribution of aerosols and water vapor in the earth's mixing or boundary layer is examined. From these data the maximum height to which particulate pollutants actually mix was determined. Data are shown for simultaneous lidar, rawinsonde, and aircraft-mounted condensation nuclei counter and temperature measurements. The synoptic meteorology is also presented. The Willamette Valley, Oregon, was chosen for the measurements because of its unique combination of meteorology, terrain, and pollutant source, along with an ongoing Oregon State University study of the natural ventilation of this valley. (Woodard-USGS)
W73-04102

LARGE POWER PLANT EFFLUENT STUDY (LAPES) VOLUME 3 - INSTRUMENTATION,

PROCEDURES, AND DATA TABULATIONS (1970),
Environmental Protection Agency, Research Triangle Park, N.C. Div. of Meteorology.
For primary bibliographic entry see Field 05A.
W73-04121

MERCURY CONCENTRATION IN RECENT AND NINETY-YEAR-OLD BENTHOPELAGIC FISH,
Duke Univ., Beaufort, N.C. Marine Lab.
T. R. Barber, A. Vijayakumar, and F. A. Cross.
Science, Vol 178, p 636-638, November 10, 1972. 1 fig, 1 tab, 20 ref. NSF-27725 and GA-28742.

Descriptors: *Mercury, *Fish, *Oceans, Aquatic habitats, Heavy metals, Water quality, Statistical methods.
Identifiers: *Benthopelagic fish, Bottom-dwelling fish, Size-concentration curve.

Several species of bottom-dwelling fish from 2500 meters with similar feeding habits had mercury concentrations that differed by an order of magnitude. Within one species there was a correlation between size and concentration, with the larger individuals having mercury concentrations as high as 0.8 part per million (wet weight). The mercury content of the water in the deep-ocean habitat of these fish appears not to determine the mercury content of a particular fish; species-specific factors and size do appear to determine this concentration. The species-specific variation between the recent fish also existed between the same two species in specimens collected 90 years ago from a depth of 2000 meters, and a 90-year-old specimen fit closely the size-concentration regression curve for nine recent individuals of the same species. (Oleszkiewicz-Vanderbilt)
W73-04122

CONCENTRATION FACTORS OF CHEMICAL ELEMENTS IN EDIBLE AQUATIC ORGANISMS,
California Univ., Livermore. Lawrence Radiation Lab.
For primary bibliographic entry see Field 05C.
W73-04125

ON THE STATE OF MERCURY (II) TRACES IN AQUEOUS SOLUTIONS - COLLOIDAL BEHAVIOR OF MERCURY,
Technical Univ. of Prague (Czechoslovakia). Dept. of Nuclear Chemistry.
For primary bibliographic entry see Field 05A.
W73-04126

METHYLMERCURY, A REVIEW OF HEALTH HAZARDS AND SIDE EFFECTS ASSOCIATED WITH THE EMISSION OF MERCURY INTO NATURAL SYSTEMS,
Stockholm Univ. (Sweden). Dept. of Biochemistry.
For primary bibliographic entry see Field 05C.
W73-04127

METHOD AND APPARATUS FOR CONTROLLING SUBNATANT OIL SEEPAGE,
For primary bibliographic entry see Field 05G.
W73-04128

BUFFALO LAKE RECREATIONAL WATER QUALITY: A STUDY IN BACTERIOLOGICAL DATA INTERPRETATION,
National Environmental Research Center, Cincinnati, Ohio.
E. E. Geldreich.
Water Research, Vol 6, No 8, p 913-924, August 1972. 5 fig, 43 ref.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

Descriptors: *Coliforms, *Water quality, Storm runoff, Domestic wastes, Feed lots, Water skiing, Fishing, Swimming, Sewage treatment, Recreation, *Texas, Pollution abatement.
Identifiers: *Buffalo Lake (Texas), Wildlife refuge.

Bacteriological measurement of recreational water quality must be based on detection of fecal contamination by all warm-blooded animals. The use of fecal coliform as an indicator of contamination was discussed, and the system was illustrated by a study of water quality in Buffalo Lake. Located 30 miles southwest of Amarillo, Texas, Buffalo Lake is part of a national wildlife refuge with areas for swimming, boating, fishing, and camping. Its water source is a drainage basin receiving only 15 in. of rainfall per year and supporting approximately 15,000 people and 180,000 cattle. While water quality is excellent during dry weather, stormwater runoff produces fecal coliform values well in excess of the recommended 200 organisms per 100 ml. limit. Corrective measurements discussed included: (1) better control of discharges from domestic sewage and cattle feedlot drainage, (2) restriction of bathing and water skiing when inflow exceeds 450 acre-ft., (3) restriction in the horsepower and number of powerboats, and (4) maintenance of a buffer zone between the wildlife refuge and the recreational areas. (Murphy-Texas)
 W73-04162

REDUCTION OF ATMOSPHERIC TOLUENE DIISOCYANATE BY WATER VAPOR,
 Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.

W. L. Dyson, and E. R. Hermann.

Am Ind Hyg Assoc J. Vol 32, No 11, p 741-744. 1971. Illus.

Identifiers: *Atmospheric humidity, Cyanates, Reduction, *Toluene diisocyanates, *Water vapor.

The effect of water vapor on atmospheric toluene diisocyanate (TDI) was determined quantitatively. At 24 deg C and atmospheric pressure a maximum reduction of 50% was obtained for initial TDI concentrations of 0.4 and 0.034 ppm. The percentage reduction of TDI depended almost solely on the water vapor concentration. The data suggest that increased humidity would be only marginally useful as a control method. They do, however, emphasize the need for sensitive analytical procedures to measure both TDI and the TDI urea around the TLV of 0.02 ppm.—Copyright 1972, Biological Abstracts, Inc.
 W73-04184

NAVIGATION AS ONE SOURCE OF POLLUTION OF WATER BASINS BY CARCINOGENIC HYDROCARBONS (IN RUSSIAN),
 Institut Eksperimentalnoi i Klinicheskoi Onkologii, Moscow (USSR).

A. P. Il'inskii, V. G. Klubkov, and L. M. Shabad. Vopros Onkol. Vol 18, No 1, p 49-54. 1972. English summary.

Identifiers: *Carcinogenic hydrocarbons, Navigation, Water pollution sources, *River basin, *Benzaprene.

The carcinogen benz(a)pyrene (BP) is present in soot from ship engines at a concentration ratio of 100:10:1. The BP content is 2-10 times higher in water with heavy navigation than in lightly navigated water. Reservoir experiments showed BP pollution from motor boat exhaust. Sixty min of engine operation produced a discharge of 0.5 mg of BP into the water.—Copyright 1972, Biological Abstracts, Inc.
 W73-04186

HYDROGRAPHIC SURVEY OF THE GALVESTON BAY SYSTEM, TEXAS 1963-66,
 National Marine Fisheries Service, Galveston, Tex.

For primary bibliographic entry see Field 02L.

W73-04190

MARINA DEL REY: A STUDY OF ENVIRONMENTAL VARIABLES IN A SEMI-ENCLOSED COASTAL WATER,
 University of Southern California, Los Angeles. Sea Grant Program.
 F. R. Bowerman, and K. Y. Chen.

University of Southern California Sea Grant Program Publication No USC-SG-4-71, December 1971. 59 p, 14 fig, 13 tab.

Descriptors: *Water quality, *Water analysis, *Chemical analysis, *Harbors, *California, Marinas, Recreation facilities, Water sports, Environmental effects, Water pollution sources, Pollutant identification, Water temperature, Heavy metals, Pesticides, Dissolved oxygen, Sedimentation, Storm water.
Identifiers: *Marina del Rey (Calif), Enclosed coastal water.

The Marina del Rey boat harbor of Southern California was opened to the public in 1962. Because of rapid population growth around the Marina and the increasing number of small crafts using the channels, environmental conditions of the marina and potential sources of contamination were investigated. Data were collected at 125 stations for studying the environmental variables in the marina. There was a slight temperature difference of about 1 deg C between the top and bottom waters. Comparative study of the 1962, 1964, and 1969 bathymetric maps of the Marina by Los Angeles County Engineers showed a mean depth range of 3.5 m increasing to 7.5 m toward the midchannel and breakwater. Concentration of mercury in the Marina water column was less than 0.3 ppb; lead ranged from 0.1 to 0.2 ppb; cadmium from 2.5 to 5.0 ppb; and antimony from 1.0 to 0.3 ppm. The sediments are composed mostly of gray to grayish brown muddy sand with mean grain size of 0.250 mm. Concentrations of pesticides in storm water were below 1.0 ppb. (Woodward-USGS)
 W73-04197

ABSORPTION OF WATER BY A SOIL FROM A CIRCULAR CYLINDRICAL SOURCE,
 California State Univ., San Jose. Dept. of Civil Engineering and Applied Mechanics.
 R. Singh.

Water Resources Research, Vol 8, No 6, p 1581-1589, December 1972. 4 fig, 11 ref.

Descriptors: *Path of pollutants, *Radioactive wastes, *Diffusion, *Soil water movement, *Translocation, Equations, Radioactive waste disposal, Malenclaves, Ion exchange, Heat flow, Mass transfer, Ion transport, Groundwater movement.

Underground burying of radioactive liquid and solid wastes has been practiced for years at Hanford, Oak Ridge, and other places. These highly dangerous wastes can diffuse out in lateral directions if the containers crack due to earthquakes and internal pressures in relatively thin confined stratum. These situations are often characterized as the absorption of moisture by the partially saturated soil surrounding the disposal site. This phenomenon is governed by a nonlinear partial differential equation, subject to initial and boundary conditions. A method of weighted residuals is applied to extract an explicit solution, which is simple for applications. The solution is valid for any form of the diffusivity function and can be used with any value of initial moisture content. (Knapp-USGS)
 W73-04200

LINE SOURCE DISTRIBUTIONS IN TWO DIMENSIONS: APPLICATIONS TO WATER QUALITY,
 Manhattan Coll., Bronx, N.Y. Environmental Engineering and Science Program.
 D. M. Di Toro.

Water Resources Research, Vol 8, No 6, p 1541-1546, December 1972. 2 fig, 1 tab, 9 ref.

Descriptors: *Dispersion, *Chemical degradation, *Path of pollutants, *Mathematical models, Numerical analysis, Mixing, Biochemical oxygen demand, Dissolved oxygen, Oxygen sag, Mass transfer, Currents (Water), Estuaries.

The steady state two-dimensional concentration distribution that results in the horizontal plane from the continuous discharge of a nonconservative substance into an infinite body of water is analyzed. The analysis is readily extended to sequentially reacting substances, so that the solution can be applied to the calculation of concentration distributions of biochemical oxygen demand (BOD) and dissolved oxygen (DO) deficit. The resulting solutions are easily applied by using a table and figures. A numerical example is presented to illustrate the method. The approach is essentially the two-dimensional analog of the steady state analysis conventionally applied to a one-dimensional estuary. The physical situation is given as an infinite vertically well-mixed body of water, which may be tidal, for which the predominant mass transport mechanism is dispersion. A uniform line source of mass decays following first order kinetics in a two-dimensional dispersive field. (Knapp-USGS)
 W73-04201

RELATIVE DIFFUSION IN NONISOTROPIC TURBULENCE,
 Technical Univ. of Denmark, Copenhagen. Sanitary Engineering Lab.
 J. Odgaard.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9503, p 239-258, January 1973. 4 fig, 2 tab, 23 ref, 1 append.

Descriptors: *Diffusion, *Turbulent flow, *Path of pollutants, *Dispersion, Drag, Mixing, Turbulence, Roughness (Hydraulic), Flow resistance, Shear stress.

Based on knowledge of those turbulent water-flow conditions which establish the minimum rate of turbulent surface diffusion, a simple relation was derived for the estimation of the rate of minimum dilution in nonisotropic bottom-generated surface turbulence, when the dimensions of the diffusion phenomenon is of the order of magnitude of the depth of water, and the movements of the fluid particles are mutually correlated. Two series of relative two-particle surface diffusion in laboratory flumes were combined with measurements of space correlation coefficients. The friction coefficient, depth, and downstream distance are the only parameters needed for a reliable prediction of the frequency distribution of the surface pollution of a conservative substance. (Knapp-USGS)
 W73-04212

LONGITUDINAL DISPERSION IN SINUOUS CHANNELS,

James Cook Univ. of North Queensland, Townsville (Australia). Dept. of Engineering. S. Fukuoka, and W. W. Sayre.
 Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9479, p 195-217, January 1973. 8 fig, 2 tab, 24 ref, 1 append. FWQA Grant No 921141.

Descriptors: *Dispersion, *Open channel flow, *Meanders, *Hydraulic models, Tracers, Path of pollutants, Mixing, Convection, Rivers.

The longitudinal spreading of tracer solution and the distribution of velocity were investigated in a laboratory flume having a series of 13 uniform bends in alternating directions. Viewing the tracer cloud as a whole, the dispersion process behaves like a one-dimensional diffusion process, as in a straight channel. The dispersion coefficient is

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources of Pollution

larger, and the initial convective period is shorter than in an equivalent straight channel. From the perspective of a single cross section, however, the process is periodic. The convective dispersion coefficient attains a maximum at about the middle of each bend, a minimum between bends, and lags the mean square velocity deviation by about a quarter of a bend. Analysis of the flume data together with available river data indicates that the dispersion coefficient tends to increase with increasing radius of curvature, and decrease with increasing bend length and depth. (Knapp-USGS) W73-04214

DISPERSION FROM PIT IN UNIFORM SEEPAGE,

Canterbury Univ., Christchurch (New Zealand). Dept. of Civil Engineering.

B. W. Hunt.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9474, p 13-21, January 1973. 2 fig, 4 ref, 3 append.

Descriptors: *Dispersion, *Path of pollutants, *Groundwater movement, *Radioactive wastes, Tracers, Mixing, Seepage, Radioactive waste disposal, Radioactivity, Radioisotopes.

A solution is given for the steady-state dispersion of a pollutant from a pit in uniformly seeping groundwater. Lateral dispersion, longitudinal dispersion, and radioactive decay are all considered in the solution. Longitudinal dispersion is relatively unimportant for steady-state seepage and the effects of lateral dispersion often may be negligible compared to the changes in concentration brought about by radioactive decay. (Knapp-USGS) W73-04222

EFFECTS OF VARIOUS SOIL FUNGI AND INSECTICIDES ON THE CAPACITY OF MUCOR ALTERNANS TO DEGRADE DDT,

Wisconsin Univ., Madison. Dept. of Entomology. J. P. E. Anderson, and E. P. Lichtenstein. Canadian Journal of Microbiology, Vol 18, No 5, p 553-560, May 1972. 6 tab, 24 ref.

Descriptors: *DDT, *Soil fungi, *Insecticides, *Microbial degradation, Cultures, Spores, Chlorinated hydrocarbon pesticides, Growth rates, Water pollution sources, Radioactivity techniques, Soil contamination, Carbamate pesticides, Phosphothioate pesticides, Thiocarbamate pesticides, Polychlorinate biphenyls, Aldrin.

Identifiers: *Mucor alternans, *Pollutant effects, Metabolites, Substrate utilization, Lindane, Parathion, Dyfonate, p' DDT, Carbaryl, Temik, Alpha-naphthol, Azinphosmethyl, Malathion, Parathion, p-nitrophenol, Aroclor 1254.

The effects of various species of soil fungi and of various insecticidal chemicals on the capacity of *Mucor alternans* to degrade DDT were investigated. Pure cultures of the fungus *Mucor alternans*, isolated from DDT-contaminated soils, were able to degrade DDT to water-soluble metabolites. After the addition of fungal spores to DDT-contaminated soils, however, the insecticide-degrading capacity of the fungus was no longer evident. Since under field conditions many species of fungi are simultaneously exposed to mixed residues of pesticidal chemicals, the effects of various species of soil fungi and of various insecticides on DDT degradation by *M. alternans* were investigated. Experiments were conducted to study the effect of nine fungal species, their stale cell-free media, and various insecticides and related compounds on the capacity of *M. alternans* to degrade C-14-DDT to water-soluble metabolites. It was found that several pure fungal cultures of some cell-free media, in which mycelium had grown, could also degrade the insecticide. In most cases, however, addition of one of the various fungi to C-14-DDT-treated *M. alternans* cul-

tures resulted in a total depression of the appearance of water-soluble metabolites in the media. This was due to an accumulation of the metabolites in the mycelium of the other fungus or in an inhibition of metabolite formation. Addition of stale media from various fungi to C-14-DDT-treated *M. alternans* cultures had various effects on fungal growth and on the capacity of the fungus to degrade the insecticide. (Byrd-Battelle) W73-04232

EVALUATION OF HERBICIDES FOR POSSIBLE MUTAGENIC PROPERTIES,

Battelle Memorial Inst., Ohio. Columbus Labs. For primary bibliographic entry see Field 05C. W73-04233

MICROBIOLOGY OF WATER,

Environmental Protection Agency, Cincinnati, Ohio.

E. E. Geldreich.

Journal Water Pollution Control Federation, Vol 44, No 6, p 1159-1172, June 1972. 83 ref.

Descriptors: *Bioindicators, *Pathogenic bacteria, *Coliforms, Cultures, *Isolation, *Iron bacteria, *Sulfur bacteria, Pulp wastes, *Water pollution sources, *Mollusks, Agricultural wastes, Pulp and paper industry, Pseudomonas, Soil analysis, *Salmonella*, Bacteria, Enteric bacteria, Sampling, Pesticides, Toxicity, Pesticide toxicity, Radioactivity techniques, *Reviews.

Identifiers: Survival, Klebsiella, Dibutox, Adenosine triphosphate, Streptococcus faecium, Pseudomonas aeruginosa, Culture media, Enrichment, *Thermus aquaticus*, *Candida*, *Rhodotorula glutinis*, Ferrobacillus ferrooxidans, Ferrobacillus sulfoxidans, Thiobacillus thiocyanidis, Caulobacter, Streptomyces, Trichosporon penicillatum, Trichosporon capitatum, Sulfate liquors, Endamoeba histolytica, *Salmonella typhimurium*.

The literature on various aspects of bacterial and viral contamination of water is reviewed with brief comments on results of various studies. The review covers microbial indicators of pollution, microbiology of rivers, lakes, and potable water, and microbiology of the estuarine environment. (Little-Battelle) W73-04235

RADIOACTIVE WASTES,

Minnesota Univ., Minneapolis.

C. P. Straub.

Journal Water Pollution Control Federation, Vol 44, No 6, p 1115-1123, June 1972. 123 ref.

Descriptors: *Reviews, *Radioactive wastes, *Radioactive waste disposal, *Methodology, Water pollution sources, Breeder reactors, Chemical wastes, Fallout, Industrial wastes, Radioisotopes, Solvent extractions, Radioactivity, Ion exchange, Sea water, Absorption, Chemical precipitation, Underground waste disposal, Resins, Path of pollutants.

Identifiers: *Turbidite layers, *Cascadia basin, Foraminifera, Radiolarians, R-mode factor analysis, Characterization, Data interpretation.

Replicate cores taken at four stations within Cascadia Basin were analyzed to evaluate the stratigraphic variability of turbidite layers. A ratio of planktonic foraminifera to radiolarians was partitioned as a biostratigraphic indicator by a modified acceptance sampling procedure, while hierarchical analysis of variance was used to evaluate biostratigraphic correlations. An R-mode factor analysis was applied to size distribution data, and 5 factors were found to reflect turbidite deposition. Comparison of the biostratigraphy of the cores with the position and factor values of turbidite horizons indicates that small-scale (1-2 km) horizontal facies changes in the coarse layers complicate or preclude most correlations between cores. These variations in facies render textural parameters useless as correlative tools and suggest that correlation of turbidites should be attempted only within the framework of finely resolved biostratigraphy. Facies changes appear to be more severe in channel deposits than in interfluvial sediments. (Long-Battelle) W73-04249

NOTES ON A MANGROVE LAGOON AND MANGROVE CHANNELS AT LA FARGUERA,

Puerto Rico Univ., Mayaguez. Dept. of Marine Sciences.

For primary bibliographic entry see Field 05C. W73-04241

FLOCCULANT PRODUCTION FROM KEROSENE,

University of Western Ontario, London. Dept. of Bioengineering.

E. Knottig, and J. E. Zajic.

Biotechnology and Bioengineering, Vol 14, No 3, p 379-390, May 1972. 8 fig, 1 tab, 12 ref.

Descriptors: Nutrients, Metabolism, Growth rates, Polymers, Flocculation, *Fermentation, Cultures, Nutrient requirements.

Identifiers: *Corynebacterium hydrocarbolastus, *Substrate utilization, *Flocculants, *Kerosene, *Hydrocarbon-oxidizing bacteria, Hydrocarbons, Growth media, Flocculent bacteria, Paraffins, Aromatic hydrocarbons, Chemical composition, Culturing vessels.

Growth studies in shake flasks and fermenters were made to obtain maximal extracellular polymer and biomass production from kerosene-utilizing *Corynebacterium hydrocarbolastus*. Polymer accumulation peaked in the fermenter after 50-60 hr cultivation, amounting to about 5.5-6 g/l broth. Initial kerosene volume (2 percent v/v) yielded polymer and cell values corresponding to 37-40 percent and 67-87 percent w/w of kerosene supplied, respectively. Exponential phase polymer and cell production rates were 0.25 g/l hr and 0.27 g/l hr with maximum production of polymers at 6 g/l. (MacLean-Battelle) W73-04245

STUDIES ON VARIANTS OF BACILLUS STEAROTHERMOPHILUS STRAIN NCA 1518,

Missouri Univ., Columbia. Dept. of Food Science and Nutrition.

For primary bibliographic entry see Field 05A. W73-04246

ANALYSIS OF TURBIDITE CORRELATION IN CASCADIA BASIN, NORTHEAST PACIFIC OCEAN,

Washington Univ., Seattle. Dept. of Oceanography.

B. Carson, and D. A. McManus.

Deep-Sea Research, Vol 18, No 6, p 593-604, June 1971. 7 fig, 1 tab, 20 ref.

Descriptors: *Core drilling, *Mathematical studies, *Plankton, *Statistical methods, Cores, Sampling, *Pacific ocean, Bioindicators, Facies (Sedimentary), Geologic formations, Geohydrologic units, Sedimentation, Stratigraphy, Sediments, Bottom sediments, Fluvial sediments, Mathematical models, Data collections, Oceans, Indicators.

Identifiers: *Turbidite layers, *Cascadia basin, Foraminifera, Radiolarians, R-mode factor analysis, Characterization, Data interpretation.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

SOME OBSERVATIONS ON THE REDUCTION OF 2,3,5-TIPHENYLLETETRAZOLIUM CHLORIDE BY ESCHERICHIA COLI, R. G. Pegram.

Laboratory Practice, Vol 21, No 3, p 167-170, 181, March 1972, 2 tab, 15 ref.

Descriptors: *E. coli, *Pollutant identification, *Isolation, *Classification, Chlorides, Chemical reactions, Separation techniques, Cultures, Oxidation-reduction potential, Reduction (Chemical), Hydrogen ion concentration.

Identifiers: *2,3,5-triphenyltetrazolium chloride, Biogeochemical tests, *Culture media, Chapman's Tergitol 7-TTC agar, Lactose agar, Selective media.

An attempt has been made to determine the factors which affect the reduction of 2,3,5-triphenyltetrazolium chloride (TTC) by Escherichia coli. The evidence available suggests that the environmental pH is an important factor governing visible TTC reduction. However, it seems likely that redox potential (Eh) may also influence the reduction of TTC and therefore the interrelationships between these factors require further attention. Particular attention was given to the use of Chapman's Tergitol 7-TTC medium for the isolation and provisional identification of E. coli. A number of non-faecal coliform strains may grow on this medium at 44°C irrespective of their reaction to the Eijkman test. (Long-Battelle)

W73-04265

IMPROVED PROCEDURE FOR IDENTIFICATION OF GROUP D ENTEROCOCCI WITH TWO NEW MEDIA, Pittsburgh Univ., Pa. Dept. of Microbiology and Epidemiology.

For primary bibliographic entry see Field 05A.

W73-04253

INCIDENCE OF PROSTHECATE BACTERIA IN A POLLUTED STREAM, Washington Univ., Seattle. Dept. of Microbiology.

J. T. Staley.

Appl Microbiol. Vol 22, No 4, p 496-502, 1971.

Identifiers: Anacalomicrobium, Asticcacaulis, Bacteria, Caulobacter, Coliforms, Hyphomicrobium, Prosthecate bacteria, Prosthechloris, Prosthecomicrobium, Rhodomicrobium, Seasonal, Stream pollution, Michigan, Red Cedar River (Mich.).

Water samples were collected aseptically several times throughout the year at 9 stations on Red Cedar River, a stream flowing through farmland and receiving effluent from several municipalities in central Michigan. Total prosthecate bacteria were enumerated by both direct and viable counting techniques. By direct techniques, these bacteria accounted for 0.62 to 1.1% of the total microflora during the study. The predominant type of appendaged bacteria was the caulobacters (Caulobacter, Asticcacaulis and 1 of the fusiform caulobacters), which accounted for 64 to 93% of total prosthecate forms. The others of importance were prosthecomicrobium (<1 to 24%), including Prosthecomicrobium and Prosthechloris; hyphomicrobia (<1 to 15%), including Hyphomicrobium and Rhodomicrobium; and Anacalomicrobium (<1 to 6%). The visible counts of heterotrophs indicated that caulobacters were the most numerous prosthecate bacteria in the stream. They ranged from fewer than 1/ml to a maximum of almost 4000/ml. During the coldest period, when the total viable counts decreased to about 10,000/ml compared to their summer high of over 10,000,000/ml, the caulobacters actually increased in numbers. In Dec. (temperature 0 to 1 degree C), they comprised from 0.09 to 1.0% of the viable microbial count and in March (6.0 to 8.0 degrees C) they accounted for 0.14 to 2.8%. The other heterotrophic prosthecate bacteria were generally

found at numbers less than 1/ml, with the exception of the Dec. study when Hyphomicrobium was present in numbers as high as 2400/ml. There was no consistent correlation between the frequency of prosthecate bacteria and total coliforms in the stream during the investigation.—Copyright 1972, Biological Abstracts, Inc.

W73-04265

PREDICTING EFFECTS OF DEAD ZONES ON STREAM MIXING,

Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering. E. L. Thackston, and K. B. Schnele, Jr. Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 96, No SA 2, p 319-331, April 1970, 5 fig, 2 tab, 13 ref.

Descriptors: *Mathematical models, *Mixing, *Stream flow, Tracers, *Dispersion, *Forecasting.

Identifiers: *Longitudinal mixing, *Dead zones.

The solution of equations of longitudinal mixing in streams which include the effect of dead zones on the mixing are described. Simple methods are presented for estimating the values of the dead zone fraction and dead zone residence time fraction. These methods can be applied for estimating the extent of dispersion and for planning tracer experiments. Future work is planned to improve the accuracy and extend the usefulness of the procedures. (Anderson-Texas)

W73-04288

DETERMINATION OF A COEFFICIENT OF DISPERSION UNDER FIELD CONDITIONS: INTERIM REPORT,

Telodyne Isotopes, Las Vegas, Nev. P. S. Hackenberry, W. E. Nork, and E. H. Essington.

Available from NTIS, Springfield, Va., as NVO-1229-178; \$3.00 in paper copy, \$0.95 in microfiche. Report NVO-1229-178, Oct 1971, 99 p, 16 fig, 6 tab, 17 ref, 4 append.

Descriptors: *Dispersion, *Groundwater movement, *Nuclear wastes, *Tracers, *Path of pollutants, Mathematical models, On-site investigations, Deserts, Nevada, Alluvium, Aquifers, Water pollution sources, Underground, Nuclear explosions, Tritium, Cobalt radioisotopes, Chelation, Iodine, Hydrologic data, Theoretical analysis, Research facilities.

Theoretical and laboratory models describing 2-dimensional dispersion of a contaminant during flow through porous media are being tested in the field. Preliminary results indicate significantly higher velocities than expected for a shallow desert alluvial aquifer. Measured ground-water flow velocities range from 2.5 to 6.4 meters per day from 2-tracer studies. As a result of laboratory studies, three tracers, I, HTO, and chelated Co60 were selected for the field study. (Bopp-ORNL)

W73-04290

THE DOSE TO MAN FROM ATMOSPHERIC KR-85,

Pennsylvania State Univ., University Park. Dept. of Nuclear Engineering.

W. S. Diethorn, and W. L. Stockho. Health Physics, Vol 23, No 2, p 653-662, Nov 1972, 4 fig, 3 tab, 26 ref.

Descriptors: *Nuclear wastes, *Radiation, *Krypton, *Radioisotopes, *Effluents, *Air pollution, Water pollution, Water pollution sources, Equilibrium, Hydrology, Path of pollutants, Food chains, Public health.

Identifiers: *Fuel reprocessing plants.

The contribution of atmospheric Kr-85 to man's dose burden is reexamined. Earlier work is updated and the major dimensions of the problem

discussed. Today, the dose ranges from a bare skin dose of approximately 0.001 mrad/yr to a whole body dose of approximately 0.0001 mrad/yr. The skin dose is comparable to the whole body dose from natural H3. If the world-wide practice of dumping Kr-85 into the atmosphere is not curtailed, these doses will increase by a factor of 30 in the next decade or two. (Houser-ORNL)

W73-04291

RADIOCARBON IN THE SEA,

Washington Univ., Seattle. Dept. of Chemistry. A. W. Fairhall, A. W. Young, and P. A. Bradford. Available from NTIS, Springfield, Va., as RLO-2225-T-20-6. \$3.00 paper copy, \$0.95 microfiche. Report RLO-2225-T-20-6, 1971, 14 p, 7 fig, 16 ref.

Descriptors: *Nuclear explosions, Testing, *Evaluation, *Fallout, *Carbon, *Assay, *Oceans, Mixing, Diffusion, Dispersion, Survey, *Radioactive tracers, Air pollution, Water pollution, Water pollution sources.

Identifiers: Carbon-14.

With the resumption of nuclear testing in 1961-62, the unprecedented scale of testing indicated a significant input of fresh bomb-produced ("excess") C14 into the atmosphere. This excess C14 has been a useful tracer for studying atmospheric mixing and air-sea exchange of CO2. Beginning in 1963 the fate of this bomb C14 was studied, concentrating on measurements in the oceans since this is expected to be the ultimate sink for most of the excess C14. Much of the work is conducted in the southern oceans where the high wind speeds and large ocean areas at mid-latitudes are conducive to a large amount of air-sea exchange of CO2. (Houser-ORNL)

W73-04292

SHALLOW-WATER STRONTIUM-90 ANOMALY ABOUT THE ANTILLES ARC-1970,

Woods Hole Oceanographic Institution, Mass. V. T. Bowen, W. G. Metcalf, and J. C. Burke. Available from Yale Univ., New Haven, Conn. 06520; \$3.50 per copy. Journal of Marine Research, Vol 30, No 1, p 112-120, Jan 1972, 3 tab, 11 ref.

Descriptors: Hydrography, *Measurement, *Surveys, *Strontium, *Assay, Oceans, Oceanography, Ocean circulation, Ocean currents, Sampling, Data collections, *Mixing.

Identifiers: *Caribbean sea.

Vertical profiles about the southeastern approaches to the Caribbean in early 1970 have shown a consistent Sr-90 inversion, with the maximum concentrations at depths of about 100 m. It appears that four water masses may be involved in this area, in a very complicated mixing and over-layering phenomenon. Additional samples are to be analyzed. (Houser-ORNL)

W73-04293

RADIOACTIVE WASTE REPOSITORY PROJECT: ANNUAL PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 30, 1972,

Oak Ridge National Lab., Tenn. A. L. Boch, J. O. Blomeke, W. C. McClain, and B. F. Bottendifield.

Available from NTIS, Springfield, Va., as ORNL-4824, \$3.00 paper copy, \$0.95 microfiche. Report No. ORNL-4824, Dec 1972, 282 p, 55 fig, 19 tab, 128 ref.

Descriptors: *Nuclear powerplants, *Nuclear wastes, *Waste disposal, Water pollution, *Water pollution sources, Geology, Hydrology, Ecology, Ecosystem, Monitoring, Economics, *Kansas.

Identifiers: *Salt mines.

Concerns about the long-term geologic stability of the salt formation at Lyons, Kansas, resulted in a

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources of Pollution

search for an alternative site for the first radioactive waste repository and in a reassessment of the suitability of other geologic structures than salt for this purpose. Conclusions were that salt formations continue to offer the best prospects; thus, following experimental confirmation of the suitability of a site, construction of a pilot plant repository in salt is planned for the early 1980's. If the results of operating this pilot plant are uniformly favorable, the facility may eventually be converted into a fully operational, permanent repository. Results of geological investigations at Lyons and the attendant investigations of alternative sites are summarized. Other topics are: progress on the experimental phases of the program that are concerned with structural analyses of the geologic formation within which the repository may be located; studies of isotope transport by various mechanisms within the repository; considerations of the chemical and radiation effects near the buried wastes; calculations of the thermal conditions to be imposed as a consequence of waste burial; potential ecological effects; conceptual design studies of the pilot plant; and a description of the proposed pilot plant experimental program. (Houser-ORNL) W73-04294

AN INVESTIGATION INTO THE DETERMINATION OF PLUTONIUM IN SOIL BY A FUSION PROCEDURE.

Mound Lab., Miamisburg, Ohio.
R. K. Gillette, M. L. Curtis, E. B. Nunn, J. O. Frye, and C. T. Bishop.

Descriptors: *Nuclear wastes, *Analytical techniques, *Radioactivity techniques, *Monitoring, Soil analysis, Soil contamination, Public health, *Path of pollutants.
Identifiers: *Plutonium.

Comparison of results by fusion and leaching procedures showed that about 93% of the Pu in one soil was recovered by leaching; studies with additional soils are planned. After fusion, dissolution, coprecipitation, extraction into xylene, back extraction, and electrodeposition, the Pu was finally determined by alpha pulse-height analysis. (Bopp-ORNL) W73-04295

STRONTIUM-90 IN THE GREAT LAKES: CONCENTRATION-TIME MODEL,

Northwestern Univ., Evanston, Ill. Dept. of Geological Sciences.
For primary bibliographic entry see Field 05A.
W73-04296

EVALUATION OF TREATMENT PLANTS BY TRACER METHODS. ANNUAL REPORT, JAN. 1971-JAN. 1972,

Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

T. F. Craft, G. G. Eichholz, and S. N. Millsbaugh.
Available from NTIS, Springfield, Va., as ORO-4156-1; \$3.00 in paper copy, \$0.95 in microfiche. Report ORO-4156-1, Feb 1972, 45 p, 9 fig, 2 tab, 4 ref. AEC AT-(40-1)-4156.

Descriptors: *Stable isotopes, *Tagging, *Tracers, Systems analysis, Neutron activation analysis, Gamma rays, Spectrometers, Standards, Sampling, Sewage treatment, Sediments, Particle size, Cation exchange, *Bromine, *Manganese, Treatment facilities.
Identifiers: *Indium, *Scandium.

Stable-isotope tracers were used to measure flow times in treatment plants near Georgia Tech. Indium was selected as the most suitable for neutron-activation analysis, but Sc, Mn, and Br were also used. In some cases, inorganic (vermiculite) and organic particles were tagged by slurring with a solution of tracer cation. (Bopp-ORNL) W73-04297

RUSSIAN RADIOECOLOGY. A BIBLIOGRAPHY OF SOVIET PUBLICATIONS WITH CITATIONS OF ENGLISH TRANSLATIONS AND ABSTRACTS,

Division of Radiological and Environmental Protection (AEC), Washington, D.C.

A. W. Klement, Jr., and V. Schultz.
Available from NTIS, Springfield, Va., as TID-3915 (Suppl.1), \$3.00 in paper copy, \$0.95 in microfiche. Report TID-3915 (Suppl.1), Sept 1972, 66 p, 646 ref. AEC AT (45-1)-2221.

Descriptors: *Radioecology, *Bibliographies, *Translations, *Radioisotopes, Tracers, Radioactivity techniques, Path of pollutants, Absorption, Neutron activation analysis, Analytical techniques, Abstracts, Nuclear wastes, Fallout, Aquatic life.
Identifiers: *USSR.

Works by Soviet scientists which appear in Soviet publications and a few which appear in publications of other countries are listed. The order is alphabetical, according to the first author. New translations were provided in cases where errors were detected. Transliteration was standardized as given in the U.S. Government Printing Office Style Manual. Nuclear Science Abstracts was searched through 1971. English translations are indicated when available. (Bopp-ORNL) W73-04298

ECOLOGICAL STUDIES OF RADIOACTIVITY IN THE COLUMBIA RIVER ESTUARY AND ADJACENT PACIFIC OCEAN, PROGRESS REPORT, JULY 1, 1971-JUNE 30, 1972,

Oregon State Univ., Corvallis. School of Oceanography.

N. Cushman.
Available from NTIS, Springfield, Va., as RLO-2227-T12-30; \$3.00 in paper copy, \$0.95 in microfiche. Report RLO 2227-T-12-30, June 1972, 248 p.

Descriptors: *Radioecology, *Marine animals, *Research facilities, *Columbia River, Estuarine environment, Food chains, Analytical techniques, Spectrophotometry, Neutron activation analysis, Electrochemistry, Path of pollutants, Sediments.

Identifiers: *Grand River.
Broad research on marine radioecology is emphasized, including use of gamma-ray spectrometry for analysis of environmental radionuclides, use of atomic absorption spectrophotometry, neutron activation analysis, and (presently being set up) use of liquid scintillation and electrochemical analysis. This report includes 17 reprints or preprints; abstracts of 15 chapters contributed to the book, The Columbia River Estuary and Adjacent Ocean Waters (edited by A. T. Pruter and D. L. Alverson); and abstracts of 5 theses. (Bopp-ORNL) W73-04299

TECHNIQUES FOR THE CHARACTERIZATION OF SUSPENDED SEDIMENT AND SELECTED APPLICATIONS FOR THE ACQUIRED DATA,

Battelle-Northwest, Richland, Wash. Pacific Northwest Lab.

R. C. Routsong, and R. E. Wildung.
Available from NTIS as BNWL-SA-4385; \$3.00 in paper copy, \$0.95 in microfiche. Report BNWL-SA-4385, 1972, 18 p, 2 fig, 6 tab, 17 ref.

Descriptors: *Suspended solids, *Columbia River, *Radioactivity effects, *Erosion control, Ion exchange, Sampling, Centrifugation, Filtration, Analytical techniques, Radioactivity techniques, On-site investigations, Research and development, Tracers, Deposition (Sediments), Sedimentation rates, Particle size, Nuclear wastes.

Suspended Columbia River sediments were sampled either by continuous ultracentrifugation or by filtering, but the latter method was used only for

measurement of radioactivity in which recovery from the filter was not required. Ion-exchange properties were determined using small columns. Much of the radionuclidic transport in the Columbia River occurred via sorption on sediments. Sedimentation rates were measured by a double-tracer technique. Research on reducing waterway pollution from erosion at construction, mining, or lumbering sites is suggested - soil treatment methods, on-site treatment of runoff in settling tubes, and in-steam flocculation. (Bopp-ORNL) W73-04302

RADIOLOGICAL PHYSICS DIVISION ANNUAL REPORT, ENVIRONMENTAL RESEARCH, JAN.-DEC. 1971,

Argonne National Lab., Ill.
For primary bibliographic entry see Field 05A.
W73-04303

DETERMINATION OF SELECTED TRACE ELEMENTS IN NATURAL WATER SAMPLES USING SPARK SOURCE MASS SPECTROSCOPY,

Argonne National Lab., Ill.
For primary bibliographic entry see Field 05A.
W73-04304

ENVIRONMENTAL CHEMISTRY: GRAND RIVER STUDIES,

Argonne National Lab., Ill.

J. A. Robbins, E. Callender, M. A. Wahlgren, and D. N. Edgington.
In: Report ANL-7860 (Pt. 3), Radiological Physics Division Annual Report, Jan.-Dec. 1971, p 80-100. 9 fig, 6 tab, 3 ref.

Descriptors: *Trace elements, *Sediments, *Lake Michigan, *Tributaries, Physicochemical properties, Cores, Sampling, Benthos, Heavy metals, Water pollution effects, Water pollution sources, Analytical techniques, Neutron activation analysis, Sediment discharge, Spectrophotometry, Path of pollutants.
Identifiers: *Grand River.

From sampling in February 1971, Cr, Cu, and Ni are nearly an order of magnitude higher in the Grand River than the average for the other Lake-Michigan tributaries; and from the mean annual product of flow and conductivity, trace element introduction via the Grand River exceeds the total from the other tributaries. An area ten miles north and south of the Grand River mouth was characterized by coring and grab-sampling sediments and collection of benthic organisms. Cores were sectioned at 1.0-cm intervals. Whole-sediment Na, Mn, Ca, Al, Ti, V, and Mg were determined by neutron activation analysis; acid soluble Cu, Ni, Cr, and Zn, by atomic absorption spectrophotometry. In certain samples K, Br, La, Sm, Sc, Cr, Co, Fe, Hg, and Th were determined by neutron-activation analysis; acid-soluble Mn and Fe, by atomic-absorption spectrophotometry. Profiles for Zn, Cu, Br, and soluble and total Cr showed a general exponential decrease with depth. Mixing of sediments with underlying material appeared to be more efficient closer than about a 280-ft water depth to shore. A likely maximum (in trace elements in sediments) was shown from both the Grand and St. Joseph rivers. (See also W73-04303) (Bopp-ORNL) W73-04305

STABLE ELEMENT CONCENTRATIONS AND ESTIMATIONS OF THE RADIONUCLIDE CONTENTS IN THE FISH AND INVERTEBRATES SAMPLED FROM THE WATERS ADJACENT TO PANAMA AND COLUMBIA,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 05C.
W73-04307

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

CHARACTERIZATION OF THE SEDIMENTS FROM THE TUIRA AND SABANA RIVER ESTUARIES,
Puerto Rico Nuclear Center, Mayaguez.
For primary bibliographic entry see Field 05C.
W73-04308

ENVIRONMENTAL SURVEILLANCE AT HANFORD FOR CY-1971,
Battelle-Pacific Northwest Labs., Richland, Wash.
For primary bibliographic entry see Field 05A.
W73-04310

IODINE-129 IN THE ENVIRONMENT AROUND A NUCLEAR FUEL REPROCESSING PLANT,
Office of Radiation Programs, Washington, D.C.
Field Operations Div.
For primary bibliographic entry see Field 05A.
W73-04311

OBSERVATIONS OF RADIORUTHENIUM AND RADIOCERIUM ISOTOPIC ACTIVITY RATIOS IN RAIN WATER,
Radiation Center of Osaka Prefecture, Osaka (Japan).
For primary bibliographic entry see Field 05A.
W73-04313

FALLOUT PROGRAM. QUARTERLY SUMMARY REPORT, JUNE 1, 1972 THROUGH SEPT. 1, 1972,
New York Operations Office (AEC), N.Y. Health and Safety Lab.
E. P. Hardy, Jr.
Available from NTIS, Springfield, Va., as report HASL-259. \$3.00 paper copy, \$0.95 microfiche. Report No HASL-259, Oct. 1, 1972. 309 p., 30 fig., 29 tab., 89 ref., 1 bib.

Descriptors: *Monitoring, *Surveys, *Radioactivity, *Fallout, *Data collections, *Food chains, Public health, Air pollution, Water pollution, Strontium radioisotopes, Lead, Toxicity, Atlantic Ocean, Aquatic life, Soil contamination, Diets, Marine animals, Milk, Potable water.
Identifiers: Taiwan, China; New Zealand.

Current data are presented from the AEC Health and Safety Laboratory Fallout Program; the National Radiation Laboratory in New Zealand, the Radiological and Environmental Research Division at Argonne National Laboratory, and the Institute of Nuclear Science in Taiwan. The initial section consists of an interpretive report on the global fallout of strontium-90 through 1971. Subsequent sections include tabulations of radionuclide levels in fallout, surface air, stratospheric air, milk, diet, and tap water. A bibliography of recent publications related to radionuclide studies is also presented. (See also W73-04316) (Houser-ORNL)
W73-04315

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT JUNE 1, 1972 - SEPTEMBER 1, 1972 - AN APPENDIX,
New York Operations Office (AEC), N.Y. Health and Safety Lab.
E. P. Hardy, Jr.
Available from NTIS Springfield, Va., as HASL-259 App., \$3.00 paper copy, \$0.95 microfiche. Report No HASL-259 (App.), Oct. 1, 1972. 441 p.

Descriptors: *Fallout, *Air pollution, *Water pollution, *Atlantic Ocean, *Strontium, *Lead, Diets, Milk, Potable water, Food chains, Public health, Toxicity, Data collections.
Identifiers: Taiwan, China; New Zealand.

Monthly fallout data are reported for strontium deposition at world land sites and Atlantic Ocean weather stations, radionuclides and lead in surface

air, and radiostrontium in milk and tap water. Given also are tables of conversion factors and radionuclides. (See also W73-04315) (Houser-ORNL)
W73-04316

BIOENVIRONMENTAL SAFETY STUDIES, AMCHITKA ISLAND, ALASKA. CANNIKIN D + 2 MONTHS REPORT,
Battelle Columbus Labs., Ohio.
For primary bibliographic entry see Field 05C.
W73-04317

THE 1971 TRITIUM SYMPOSIUM AT LAS VEGAS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 05A.
W73-04318

PHOTOCHEMICAL DEGRADATION OF SEDIMENT ORGANIC MATTER: EFFECT ON ZN6 RELEASE,
Oregon State Univ., Corvallis.
W. M. Lenares.
Available from NTIS, Springfield, Va., as RLO-2227-T12-32; \$3.00 in paper copy, \$0.95 in microfiche. Report RLO-2227-T12-32, August 1971. 64 p., 5 fig., 2 tab., 56 ref.

Descriptors: *Radioisotopes, *Sediments, *Organic matter, *Separation techniques, Analytical techniques, Radioactivity techniques, Columbia River, Zinc radioisotopes, Cobalt radioisotopes, Absorption, Ion exchange, Path of pollutants, Nuclear wastes, Estuarine environment, Oxidation, Ultraviolet radiation, Laboratory tests.
Identifiers: Scandium radioisotopes, Manganese radioisotopes.

Various techniques were tested for removal of organic matter from sediments in connection with radionuclide absorption studies. Removal of organic matter without desorption of Zn, Co, or Sc (but with desorption of Mn) was accomplished by ultraviolet oxidation. Zn from the destroyed organic phase was reabsorbed by the inorganic fraction. However, removal of organic matter by hydrogen peroxide treatment resulted in loss of Zn. The effect of ultraviolet light on hydrous Mn oxides requires further study. (Bopp-ORNL)
W73-04319

STUDIES OF THE NATURAL ALPHA-Emitting Radioisotopes in MARINE ORGANISMS,
Washington Univ., Seattle. Lab of Radiation Ecology.

W. R. Schell.
Available from NTIS, Springfield, Va., as RLO-2225-T-14-3; \$3.00 paper copy, \$0.95 microfiche. Report RLO-2225-T-14-3, May 1972. 23 p., 1 fig., 1 tab., 2 ref. AEC AT (45-1)-2225.

Descriptors: *Lead radioisotopes, *Radium radioisotopes, *Nannoplankton, *Zooplankton, Bottom fish, Commercial fish, Marine fish, Sounds, Lakes, Water pollution effects, Absorption, Sediment transport, Fallou, Leaching, Path of pollutants, Bank erosion, Stream erosion, Sedimentology, Waves (Water), Food chains, Public health, Stable isotopes, Waste dilution, Disperser, Turnovers, Estuarine environment.
Identifiers: Polonium, *Lake Washington, *Puget Sound, Specific radioactivity.

Pathways of Pb210 and Po210 into organisms (atmospheric pollution, tidal wave and river erosion of ores, and leaching from sediments) are being studied. Preliminary data were obtained of the radioactivity of zooplankton (disintegrations per minute/gram dry weight). Values were 3 for Po210 and 0.21 for Pb210 for samples collected from Lake Washington, and 1.5-19 for Po210 and 0.02-

1.0 for Pb210 for samples from Puget Sound. Po210/Pb210 ratios in nannoplankton were 0.5 for Lake Washington, and 1.3 for Puget Sound. The specific activity of Pb210 (disintegrations per minute/microgram of Pb) in zooplankton was 0.004-0.009 in those collected from Lake Washington, and 0.02-0.06 in those from Puget Sound. A similar specific activity was found in barnacles and mussels collected from a contaminated region of Puget Sound near Seattle as for the zooplankton from Lake Washington. A tentative explanation, which may be verified by further data presently being obtained, is that lower values of specific activity in Lake Washington zooplankton result from higher pollution owing to its lower turnover rate. (Bopp-ORNL)
W73-04320

SEASONAL CONCENTRATION, TURNOVER, AND MODE OF ACCUMULATION OF P32 BY THE JUVENILE STARRY FLOUNDER IN THE COLUMBIA RIVER ESTUARY, PLATICHTHYS STELLATUS (PALLAS),
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 05C.
W73-04322

CONCENTRATION OF C-14 IN THE TROPOSPHERE DURING 1953 TO 1971, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Geokhimii i Analiticheskoi Khimii.
For primary bibliographic entry see Field 05A.
W73-04323

BEHAVIOR OF CS-137 AND CE-144 IN THE SORPTION SYSTEM SEA WATER-SEDIMENT,
For primary bibliographic entry see Field 05A.
W73-04324

RADIOLOGICAL SURVEILLANCE AT PRESSURIZED WATER REACTORS,
Environmental Protection Agency, Cincinnati, Ohio.

W. Brinck, H. Kolde, H. Krieger, and B. Kahn.
Transactions available from American Nuclear Society, Inc., 244 E Ogden, Hinsdale, Ill. 60521. \$25.00 per copy. In: Transactions of the American Nuclear Society, 1972 Winter Meeting, November 12-17, 1972, Washington, D.C., Vol 15, No 2, 1972, p 640-641. 2 ref.

Descriptors: *Nuclear powerplants, *Monitoring, *Effluents, *Surveys, *Measurement, Air pollution, Water pollution, Radioactivity, Food chains, Public health, Administrative agencies, Gases, Liquids, Connecticut, Sampling, Model studies.
Identifiers: Environmental Protection Agency, Atomic Energy Commission.

A study at the Connecticut Yankee Nuclear Power Station provides the basis for recommending a three-part radiological monitoring program for pressurized water reactors. This study, performed by the Environmental Protection Agency in cooperation with the Connecticut Department of Environmental Protection, the Atomic Energy Commission, and the station operator, is the third in a continuing series that includes previously completed projects at Dresden I and Yankee Rowe. Samples for radionuclide analyses of in-plant gases and liquids, effluents, and environmental media, as well as direct radiation measurements, were obtained in the course of periodic field trips throughout approximately one year at each station. (Houser-ORNL)
W73-04325

SOURCES OF WATER POLLUTION ESTABLISHED BY USING A NEUTRON ACTIVATING TRACER,
Pennsylvania State Univ., University Park.
J. K. Schmotzer, W. A. Jester, R. R. Parizek, and K. A. Uhler.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources of Pollution

Transactions available from American Nuclear Society, Inc., 244 E. Ogden, Hindale, Ill. 60521. \$25.00 per copy.

Descriptors: *Water pollution, *Water pollution sources, *Tracers, *Analytical techniques, *Marking techniques, *Tagging, *Tracking techniques, Nuclear meter, Neutron activation analysis, Groundwater movement, Water sources, Water supply, Potable water, Water types, Wells, Bromine, Pennsylvania.

Techniques developed for the tracing of ground water using a nonradioactive, but neutron activatable, tracer, were field tested. These tests have been primarily employed to identify sources of water pollution that are reaching wells used to supply drinking water for certain Pennsylvania communities. The primary tracer employed in these tests is the bromide ion. It has been found that this tracer is not significantly removed from the water by reaction with soil minerals and appears to follow ground water faithfully. The background concentrations of bromine in fresh water in the area where these tests were made are usually quite low - on the order of 30 ppb. Bromine concentrations at this level are readily measured by instrumental neutron activation analysis. (Houser-ORNL)
W73-04326

ACTIVATION ANALYSIS TRACE-ELEMENT STUDIES FOR MARINE BIOLOGICAL SAMPLES, Interuniversitair Reactor Instituut, Delft (Netherlands).
For primary bibliographic entry see Field 05A.
W73-04327

NUCLEAR ACTIVATION ANALYSIS OF SE, AS, ZN, CD, AND HG IN ENVIRONMENTAL MATRICES, National Bureau of Standards, Washington, D.C.
For primary bibliographic entry see Field 05A.
W73-04328

ACTIVATION ANALYSIS OF HEAVY METALS IN SURFACE WATERS USING ION EXCHANGE FILTER PAPER AND CYANIDE COMPLEXING, Gulf General Atomic Co., San Diego, Calif.
For primary bibliographic entry see Field 05A.
W73-04329

BEFORE AND AFTER STUDIES ON THE EFFECTS OF A POWER PLANT INSTALLATION ON LAKE LBJ - A NUMERICAL TEMPERATURE MODEL FOR LAKE LBJ, Texas Univ., Austin. Center for Research in Water Resources.
G. P. Park, and P. S. Schmidt.
Center for Research in Water Resources, Interim Technical Report No 1, AESL-1 CRWR 80, December 1971. 174 p, 14 fig, 4 tab, 33 ref.

Descriptors: *Reservoirs, *Temperature, *Mathematical models, Electric powerplants, Thermal pollution, Stratification, Thermocline, *Texas, Heat transfer, Effluents, Equations, Energy budget, Hydrologic aspects, Model studies.
Identifiers: *Lake Lyndon B. Johnson.

A one-dimensional mathematical model for predicting the distribution of thermal energy in a deep, stratified reservoir is developed and applied to Lake LBJ. The model takes into account heat transfer through the air-water interface, advection into and out of the reservoir, and advection and diffusion in the vertical direction within the reservoir. A comparison of predicted and observed temperature profiles shows good agreement. To predict the physical effects of the thermal discharge from a proposed power plant on a region of Lake LBJ, the model has been modified to ac-

count for temperature gradients in the longitudinal direction in addition to the vertical. Although there are limitations to the use of this two-dimensional model, it is a good starting point for more refined analyses of the physical effects of a thermal discharge on a stratified reservoir. (See also W73-04336) (Eagle-Vanderbilt)
W73-04335

BEFORE AND AFTER STUDIES OF THE EFFECTS OF A POWER PLANT INSTALLATION ON LAKE LBJ - MEASUREMENT AND PREDICTION OF ABNORMAL RESERVOIR OPERATIONS ON LAKE LBJ'S WATER QUALITY, Texas Univ., Austin. Center for Research in Water Resources.

C. W. Bullock, and E. G. Fruh.
Center for Research in Water Resources Interim Report No 2, EHE 72-3 CRWR 85, January 1972. 142 p, 21 fig, 32 tab, 29 ref.

Descriptors: *Water quality, *Baseline studies, *Reservoir operation, Projections, Model studies, Stratification, Heated water, Depth, Reservoirs, Electric powerplants, Water levels, *Texas, Mathematical models, On-site investigations, Thermal pollution.
Identifiers: *Lake Lyndon B. Johnson.

The operations of lowering the water level in Lake LBJ, rotenone killing of the rough fish, and refilling the reservoir did not degrade the water quality nor impair any of its intended uses. However, these operations did cause significant changes in the hypolimnion dissolved oxygen depletion rate, ammonia concentration, and total alkalinity concentration as well as the entire conductivity profile. Thermally stratified physical impoundment models were used to predict qualitatively the water quality in the epilimnion and hypolimnion during the first summer stratification after the reservoir refilled. For those shallow areas of the reservoir containing sandy sediments and apparently not affected by the earlier reservoir operations, good success was achieved. For the reservoir's deep stations where the water quality was affected by the earlier operations, the model's predicted values were not so good. In most cases the model's predicted water quality characteristics were within the same order of magnitude and never any more than one order of magnitude difference from those observed at the model's respective reservoir stations. (See also W73-04335) (Eagle-Vanderbilt)
W73-04336

INDEXED BIBLIOGRAPHY OF THERMAL EFFECTS LITERATURE -2, Oak Ridge National Lab., Tenn.

For primary bibliographic entry see Field 05C.
W73-04353

DEPOSITIONAL PATTERNS, FACIES, AND THERMAL ELEMENT ACCUMULATION IN THE WAUKEGAN MEMBER OF THE LATE PLEISTOCENE LAKE MICHIGAN FORMATION IN SOUTHERN LAKE MICHIGAN, Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 02J.
W73-04361

THERMAL AND MINERAL SPRINGS IN THE SOUTHERN ROCKY MOUNTAINS OF CANADA, Department of the Environment, Ottawa (Ontario). Water Management Service.
For primary bibliographic entry see Field 04B.
W73-04363

COASTAL CURRENTS OF PACIFIC NORTHWEST, Utah Univ., Salt Lake City. Dept. of Civil Engineering.

B. Glenne, and R. H. Bourke.

Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 98, No WW4, Paper 9371, p 433-441, November 1972. 1 fig, 4 tab, 21 ref, append.

Descriptors: *Ocean currents, *Pacific Northwest U.S., *Path of pollutants, Oceanography, Tides, Sewage disposal, Currents (Water), Winds, Water circulation.

To plan and design ocean outfall for sewage, cooling water, or other wastes it is necessary to have a knowledge of the nearshore current velocities and directions. An overview is presented of available nearshore current measurement of the Pacific Northwest coast along with some theoretical methods for calculating velocities. Current contributions are considered from tides, winds, waves, and upwelling. Available current data indicate that in nearshore areas effects due to bottom and shore configurations overshadow geostrophic and Ekman layer effects. Generally, theoretical methods for calculation of current velocities in coastal waters (within 5 nautical miles of the coastline) can give approximate values. However, for specific information it is usually necessary to perform local measurements. (Kapp-USGS)
W73-04364

COMPARISON OF RECHARGE TO GROUND-WATER UNDER PASTURE AND FOREST USING ENVIRONMENTAL TRITIUM, Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Soils. For primary bibliographic entry see Field 02F.
W73-04373

ELECTRONIC SPECTRA OF 2-AMINOQUINOLINE AND 4-AMINOQUINALDINE. EVIDENCE FOR THE CYCLIC AMIDINE STRUCTURE OF THE SINGLY PROTONATED CATIONS.

Florida Univ., Gainesville. Coll. of Pharmacy.
For primary bibliographic entry see Field 03A.
W73-04389

NEWER MEMBRANE CONCENTRATION PROCESSES AND THEIR APPLICATION TO THE DETECTION OF VIRAL POLLUTION OF WATERS, Gulf South Research Inst., New Orleans, La. Environmental Virology and Microbiology Section. For primary bibliographic entry see Field 05F.
W73-04390

MICROBES AS TRACERS OF WATER MOVEMENT, University Coll. of South Wales and Monmouthshire, Cardiff. Dept. of Microbiology.
J. W. T. Wimpenny, N. Cotton, and M. Statham. Water Research, Vol 6, Nos 4/5, p 731-739, April/May 1972. 7 fig, 1 tab, 4 ref.

Descriptors: *Tracers, *Bioindicators, *Tracking techniques, *Microorganisms, *Pollutant identification, Bacteriophage, E. coli, Cultures, Sampling, Yeasts, Separation techniques, Color, Flow characteristics, Path of pollutants, Antibiotics (Pesticides), Rivers, Aerobic bacteria, Resistance, Water pollution, Water flow, Isolation.
Identifiers: Culture media, *Serratia marcescens*, *Bacillus subtilis*, *Bacillus stearothermophilus*, *Hansenula*, *Rhodotorula glutinis*, Penicillin, Streptomycin, Aureomycin, Actidione, Sample preparation, Plaque counts, Taff River, Detection limits.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Sources of Pollution—Group 5B

Two species of *Bacillus*, two pigmented yeasts *Serratia marcescens*, and a lambda-like bacteriophage of *E. coli* K12 were investigated as markers for measuring the path of water in the heavily polluted Taff River. Preliminary analysis of the Taff River for natural populations of these organisms showed that the *Bacillus* species were unsuited as markers due to their high population. To measure the movement of these waters, dosing experiments were conducted by releasing high concentrations of *S. marcescens*, the two pigmented yeasts, and the phage (released some time after the bacteria), into the river and measuring the presence of these microorganisms in water samples taken 9600 ft. downstream. The organisms were detected in the water by cell and phage counts obtained by standard selective culturing procedures. *S. marcescens* proved to be an excellent marker due to its red color on a culture medium and the ease of separating it from other bacteria by its antibiotic resistance. The phage proved to be the best marker due to its easy detection, high selectivity for its host organism, low natural concentration in the river, longevity, and the lack of a public health or pollution problem from its use. (Long-Battelle)
W73-04392

THE POLLUTED WATERS IN UMBRIA: III. THE RIVER NESTORE, (IN ITALIAN),
Perugia Univ. (Italy).
V. Bacci, and M. Muccini.
Riv. Idrobiol., Vol 9, Nos 1/2, p 39-59. 1970. Illus.
English summary.
Identifiers: *Italy, Polluted river, *River Nestore, Umbria, Water pollution sources, *Industrial wastes.

This work was carried out to control the water pollution situation of Nestore River, one of the most important Tevere affluents. River analyses show that the Genna affluent is the biggest pollutant because it receives the wastewater of Perugia and other industrial towns. Samples were collected in April, May, June, July, Sept. and Dec. from 6 of the most significant places. Generally the Biological Oxygen Demand, free ammonia, anionic surfactants, phosphates and chlorides give the most significant values. A quantitative evaluation is difficult because no hydrometric station determines the flow along by the river.—Copyright 1972, Biological Abstracts, Inc.
W73-04393

YEARLY RESPIRATION RATE AND ESTIMATED ENERGY BUDGET FOR SAGITTA ELEGANS,
Bedford Inst., Dartmouth (Nova Scotia).
D. D. Sameoto.
Journal of the Fisheries Research Board of Canada, Vol. 29, No 7, p 987-996, July 1972. 6 fig., 4 tab., 25 ref.

Descriptors: *Respiration, *Energy budget, *Second productivity, *Rates, Zooplankton, Copepods, Invertebrates, Metabolism, Biomass, Marine animals, Water temperature, Laboratory tests, Invertebrates, Sampling, Plankton nets, Mathematical models, Statistical methods, Regression analysis, Dissolved oxygen.
Identifiers: *Sagitta elegans, Chaetognaths, Nova Scotia, Bedford Basin, St. Margaret's Bay.

The respiration rate of *Sagitta elegans* in Bedford Basin, Nova Scotia, was significantly different at different times of the year. Respiration rates were lower in summer and fall than during spring because the animals acclimated to warmer temperatures as the year progressed. The annual energy expenditure by respiration of the *S. elegans* population in St. Margaret's Bay, Nova Scotia, was equal to the net yearly production of the population; the calculated minimum ingested energy for this population was estimated to be between 13.2 and 20.0 kcal/100/cu/year, or about 0.7 - 1.1 per-

cent of the estimated total energy produced annually by copepods in the Bay. *S. elegans* probably has its greatest impact on the zooplankton community in St. Margaret's Bay during winter and early spring, when its biomass is greatest and its energy of respiration per unit volume of water is highest. (Long-Battelle)
W73-04400

STUDY OF THE METABOLIZATION OF POLLUTANT PRODUCTS,
Centre de Recherches de l'Onnem d'Assainissement, Colombes (France).
P. Brouzes.
Water Research, Vol 6, Nos 4/5, p 457-463, April/May 1972. 10 fig.

Descriptors: *Metabolism, *Respiration, *Pollutants, *Microbial degradation, Growth rates, Microorganisms, Biochemical oxygen demand, Computers, Mathematical models, Statistical methods, Oxygen demand, Oxygen requirements, Bioindicators, Water pollution, Toxicity.
Identifiers: *Metabolites, *Substrate utilization, Glucose, Galactose, Respirometers, Valeric acid.

The microbial metabolism of pollutant products was determined experimentally by measuring changes in respiration rates of bacteria using different carbon sources. By feeding cultures of bacteria discrete quantities of these substrates various phases of respiration were correlated to growth stages. Relationships between the oxygen used and the pollution removed by the bacteria served as an indicator of the toxicity and biodegradability of the various substrates characterized. In all cases, as soon as a substrate was introduced (either glucose, galactose, valeric acid or phenols) respiration increased. Allowing the bacteria to utilize mixtures of substrates resulted in biphasic growth curves (diauxie). (Long-Battelle)
W73-04402

REDUCTION OF AROMATIC FLUORINE COMPOUNDS,
University of Southern Mississippi, Hattiesburg, Dept. of Chemistry.
B. H. Campbell.

Analytical Chemistry, Vol 44, No 9, p 1659-1663, August 1972. 1 fig, 5 tab, 11 ref.

Descriptors: *Aromatic compounds, *Reduction (Chemical), *Electrolysis, Kinetics, Chemical reactions, Chemical analysis, Water pollution sources, Pollutant identification, Fluorine, Electrochemistry, Gas chromatography.

Identifiers: *Fluorine compounds, Benzene, Biphenyl, Naphthalene, Electron transfer, Dimethylformamide, Mercury electrode, Cyclic voltammetry.

The reduction of fluoro-aromatic compounds using mercury electrodes was studied in three compounds: fluorinated benzenes, fluorinated biphenyls, and naphthalenes. The benzene series presented a structurally simple case and the effects of electron withdrawing groups are well known. The biphenyl series allowed comparison of the effects of reducing fluorine on one ring with that on both rings. The naphthalene series represented the next step in a more extensive pi system. All data indicated a loss of fluoride upon controlled potential electrolysis of the compounds and the reactant minus the fluoride was also found as a product of electrolysis. The reduction mechanism is shown to be ECE where each electron transfer step involves one electron and the chemical step is protonation. The concept that the species produced by the first reduction step exhibits longer life as the aromaticity increases was proved by increased reversibility of the reduced molecule with increase in aromaticity. (Mortland-Battelle)
W73-04412

CHROMATOGRAPHIC DETECTION OF WATER CONTAMINANTS,
Carnegie-Mellon Univ., Pittsburgh, Pa.
For primary bibliographic entry see Field 05A.
W73-04423

SALMONELLA AS AN INDEX OF POLLUTION OF SURFACE WATERS,
Center for Disease Control, Atlanta, Ga.
For primary bibliographic entry see Field 05A.
W73-04426

EUROPE'S MAJESTIC SEWER,
For primary bibliographic entry see Field 05G.
W73-04428

A STUDY OF THE NEED FOR AND FEASIBILITY OF A PROGRAM FOR THE REMOVAL AND DISPOSAL OF DRIFT AND OTHER DEBRIS, INCLUDING ABANDONED VESSELS, FROM THE PUBLIC HARBORS AND ASSOCIATED CHANNELS UNDER THE JURISDICTION OF THE DEPARTMENT OF THE ARMY.

For primary bibliographic entry see Field 08A.
W73-04455

NON-POINT SOURCE POLLUTION FROM AGRICULTURAL, RURAL, AND DEVELOPING AREAS.

Hearings—Subcomm. on Conservation and Watershed Development—Comm. on Public Works, United States House of Representatives, 92d Cong, 2d Sess, August 15-17, 1972. 131 p, 3 fig, 1 map, 2 dwg, 1 tab.

Descriptors: *Water pollution sources, *Legislation, *Watershed management, *Surface runoff, Federal government, Water pollution, Siltation, Sedimentation, Erosion, Agricultural runoff, Erosion control, Sediment control, Strip mine wastes, Cost-benefit ratio, Chemical wastes, Small watersheds, Financing, Stream erosion, Soil contamination effects.
Identifiers: *Congressional hearings, *Non-point sources (Pollution).

Two major areas of non-point source pollution are identified in the bill HR15396: (1) agricultural and related pollutants, which cover such items as animal wastes, mineral salts, plant nutrient materials, infectious agents, and pesticides; and (2) erosion and sediment control. The latter addresses itself to four critical sediment sources: strip-mined land, roadside erosion, developing rural areas, and streambank erosion. The bill also provides for development of a summer jobs program to be designated the agriculture youth program for students of agriculture, conservation and related fields. Finally, the bill authorizes an appropriation of \$5 billion for the fiscal year 1973, to be available until expended. (Tolle-Florida)
W73-04462

BACTERIAL REDUCTION OF ARSENATE IN SEA WATER,
Rhode Island Univ., Kingston. Graduate School of Oceanography.

D. L. Johnson.
Nature, Vol 240, No 5375, p 44-45, November 1972, 1 fig, 12 ref.

Descriptors: *Arsenic compounds, Seawater, Water pollution sources, Bacteria, *Path of pollutants.

Identifiers: *Bacterial reduction, Arsenite, *Arsenate, *Narragansett Bay.

At natural concentrations in sea water, all arsenite should be oxidized to arsenate in a matter of weeks or months. The presence in ocean water of arsenite in significant quantities led to a study of

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources of Pollution

the bacterial reduction of arsenite in sea water. Sodium arsenite was added to a sterile Sargasso Sea water medium, and the resulting solution was then inoculated with a bacterial culture from Narragansett Bay obtained from phytoplankton filtered from the Bay. Concentrations of arsenite and arsenate were determined periodically. As the bacterial population entered log phase growth (at about 8 hours), arsenite began to be replaced by arsenate, while total arsenic remained constant. Demonstration of bacterial arsenite reduction in sea water under laboratory conditions indicated that this process may occur in the open sea and may explain the observed arsenite concentrations. (Murphy-Texas)
W73-04479

MEASUREMENTS OF MOVEMENTS OF SOLID SUBSTANCES IN WATER BY MEANS OF STABLE TRACERS AND ACTIVATION ANALYSIS, Palermo Univ. (Italy). Istituto di Applicazioni e Impianti Nucleari.

C. Cappadona.
Modern Trends in Activation Analysis, Vol 1, p 72-75, June 1969. 2 ref.

Descriptors: *Suspended solids, Sands, Stable isotopes, *Tracers, Sampling, Measurement, *Analytical techniques, *Path of pollutants, *Neutron activation analysis.

Identifiers: *Sand impoverishment, *Sicily.

The analysis of stable tracers contained in sand samples allows hydrologists to obtain significant information about sand movements. Stable tracers do not present a radiation threat, so do not require expensive safety procedures. The successful demonstration of this technique indicates that a more detailed knowledge of the causes of sand impoverishment on the beach is now possible. (Anderson-Texas)
W73-04490

USE OF FALLOUT CESIUM-137 AS A TRACER TO DEFINE THE RECENT DELTAIC FACIES OF A RIVER, Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health. For primary bibliographic entry see Field 02J.
W73-04501

CONSTRUCTION OF WASTE-INJECTION MONITOR WELLS NEAR PENSACOLA, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 05E.
W73-04536

A REVIEW OF THE ARSENIC CYCLE IN NATURAL WATERS, Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering. J. F. Ferguson, and J. Gavis. *Water Research*, Vol 6, No 11, p 1259-1274, November 1972. 2 fig, 3 tab, 66 ref.

Descriptors: *Water chemistry, *Arsenic compounds, *Path of pollutants, Trace elements, Poisons, Water pollution sources, Environmental effects, Food chains. Identifiers: Arsenic cycle.

A review of the occurrence and cycling of arsenic in fresh waters is presented. Thermodynamic information is summarized in an Eh-pH diagram for a system including sulfur. The mechanisms by which arsenic transfer from the solution phase to the sediments are discussed. The possible microbiologically mediated reactions of arsenic, including oxidation of arsenite, methylation of arsenic species, and reduction of arsenate, are discussed with reference to the locale of the reaction of the water column or in the sediments and to toxicological

significance. A cycle of reactions for arsenic in a stratified lake is proposed. Although arsenic is greatly concentrated in aquatic organisms, it is not progressively concentrated along a food chain. In addition, organically-bound arsenic has low toxicity. In recent times natural production of arsenic has been approximately in balance with deposition of arsenic in sediments. Human activities have increased the amount of arsenic entering the oceans by at least a factor of 3. This increase will have no effect on the concentration in the oceans for many hundreds of years. However, these cultural contributions are the source of high local concentrations in many fresh waters. (Knapp-USGS)
W73-04541

5C. Effects of Pollution

THE UPTAKE OF INSECTICIDES BY FRESH-WATER MUSSELS AND THE EFFECTS OF SUBLETHAL CONCENTRATIONS OF INSECTICIDES ON THESE MUSSELS, Michigan State Univ., East Lansing. Dept. of Entomology.

M. J. Zabik, and J. W. Bedford. Available from the National Technical Information Service as PB-214 090, \$3.00 in paper copy, \$0.95 in microfiche. Project Completion Report, December 1972, 27 p, 2 fig, 3 tab, 14 ref. OWRR A-035-MICH (1). 14-31-01-0001-3022.

Descriptors: *Absorption, *Insecticides, *Freshwater, *Mussels, *Pesticides, DDT, Dieldrin, *Michigan, Lethal limit, Water pollution effects.

Identifiers: *Red Cedar River (Mich), *Sublethal concentrations, Looking Glass River (Mich), Absolute ethanol solution, Lake Lansing (Mich).

Freshwater mussels were exposed to several concentrations of DDT (2,2-bis (p-chlorophenoxy)-1,1,1-trichlorethane) and dieldrin (hexachloroepoxyoctahydro-dro-endo, exo-dimethanonaphthalene) in natural lake water and reconstituted distilled water under continuous flow and constant temperature conditions. The mussels concentrated DDT approximately 2400 fold and dieldrin 1200 fold in lake water. They concentrated DDT about 1000 fold in distilled water. The concentration of pesticides in the mussels reached equilibrium with the level in the water faster in lake water than in distilled water and the pesticide also had a shorter half-life in the mussel in lake water. The half-life of dieldrin was 4.7 days in lake water compared to 12.6 days for DDT in lake water. The pesticide concentrations were highest in the digestive and reproductive tissue and low in the muscle, mantle, and gill tissues. The concentrations were very low in the marsupia in tests run in distilled water but were almost as great as those in the digestive and reproductive tissue in lake water. (Richardson-Michigan)
W73-03904

ECOLOGICAL FACTORS INFLUENCING PRODUCTION OF ALGAE IN NORTHERN PRAIRIE LAKES, South Dakota State Univ., Brookings. Water Resources Inst.

L. Haertel. Available from the National Technical Information Service as PB-214 094, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report, 1 October 1972. 63 p, 11 fig, 19 tab, 21 ref. OWRR A-028-SDAK (1).

Descriptors: *Algae, *Phytoplankton, *Nutrients, Bioassay, Lakes, *South Dakota, *Algal control, Ecology, *Regression analysis, Eutrophication.

Two lakes in eastern South Dakota were sampled for plankton and water chemistry from April 1970 through June 1972. These sample results were used with meteorological data to set up multiple regression analysis of the measured factors that would

be expected to affect the abundance of major algae species and major inorganic nutrients. Primary production rates were also measured on many dates by the O₂ method and the effects of selected inorganic nutrients on production rates were determined by in situ bioassay experiments. Results of multiple regression analysis by season on algal populations in the deeper of the two lakes showed repeated evidence of nitrogen and phosphorus as important controlling factors. Analysis of algal populations in the shallower, more eutrophic lake gave less consistent results. Analysis of the factors influencing the abundance of inorganic nutrients indicated wind stress and rainfall as regenerating factors for orthophosphate and ammonia in both lakes. In order to determine whether the correlations between wind stress and nutrients were determined by increased wind-generated circulation of the water in the lakes or by direct stirring of the bottom sediments by wind-generated action, wave period measurements were made on a very windy day in both lakes. Calculations made from these measurements showed that wave action could directly stir the bottom sediment throughout the lake in the shallower and more nutrient-rich lake, but not in the deeper, less eutrophic lake. The conclusion was drawn that efforts to control algal blooms by limitation of incoming nutrient supply would be beneficial in deeper, nutrient-limited lakes but not effective in many of the shallower recreational lakes because of the direct stirring of bottom sediments by wind action. (Wiersma-South Dakota)
W73-03909

AGRICULTURALLY-POLLUTED IRRIGATION WATER AS A SOURCE OF PLANT-PARASITIC NEMATODE INFESTATION, Agricultural Research Service, Prosser, Wash. Irrigated Agriculture Research and Extension Center.

For primary bibliographic entry see Field 05B.
W73-03954

THE OCEANS HAVE BECOME THE SINKS OF THE WORLD, T. Loftus. *Ceres*, Vol 5, No 1, p 35-39, January-February 1972, 3 fig.

Descriptors: *Oceans, *Oil spills, Industrial wastes, Mercury, DDT, Sewage, International law, International waters, Polychlorinated biphenyls. Identifiers: *Ocean dumping, Health hazard.

The oceans are being assailed from all areas: the air, the rivers, and marine traffic, including vessels designed for ocean dumping. Oil spills are estimated to be at least one million metric tons per year and the total influx of oil into the sea may be as high as six million metric tons. Such pollution affects marine life and may threaten humans who frequent bathing beaches around the world. Untreated sewage dumped into coastal waters presents a definite health risk, especially in enclosed and semi-enclosed waters. Deliberate dumping of other wastes, especially industrial wastes is causing disastrous deterioration of the marine environment as illustrated by bioaccumulation of mercury and DDT. The dilution effect of the ocean does not necessarily occur, and in the absence of binding international agreements the situation is expected to get worse. (Murphy-Texas)
W73-03958

POLYCHLORINATED BIPHENYLS: STILL PREVALENT, BUT LESS OF A PROBLEM, T. H. Maugh. *Science*, Vol 178, No 4059, p 388, October, 27, 1972.

Descriptors: *Polychlorinated biphenyls, Regulation, Fish, Soils, Environmental effects, *Pollu-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Effects of Pollution—Group 5C

tants, Path of pollutants, Toxicity, *Pollution abatement.
Identifiers: Regulatory actions, Food and Drug Administration, Environmental Protection Agency.

Governmental and industrial curbs on the use of polychlorinated biphenyls (PCB's) have largely halted its influx into the environment. However, PCB's may have pervaded the environment to a much greater extent than was previously suspected. PCB's have been found in tissues of polar bears and seals throughout northern Canada. In the United States, PCB's have been found in water and sediment samples from 17 to 39 states in concentrations from 0.1 to 40 ppb. The Food and Drug Administration has detected PCB's in many samples of fish, milk, eggs, and cheese. The toxic effects of PCB contamination in mink, chickens, and estuarine organisms have been observed. It was noted that current regulatory actions appear adequate and the amount of PCB's in the environment should soon start declining. (Murphy-Texas) W73-04006

LOSSES OF ZN TO INORGANIC SURFACES IN A MARINE ALGAL NUTRIENT MEDIUM, Oregon State Univ., Corvallis. Dept. of Oceanography.

R. D. Tomlinson, and W. C. Renfro. Environmental Science and Technology, Vol 6, No 12, p 1001-1005, November, 1972. 2 fig, 2 tab, 15 ref.

Descriptors: *Zinc, *Algae, *Marine algae, *Hydrogen ion concentration, Adsorption, Heavy metals, Pollution, Environment, Sea water, Water pollution effects, Path of pollutants.

Identifiers: Polypropylene, Inorganic surfaces, Precipitates, Glassware.

A study was made to evaluate the loss of zinc from a marine algal nutrient to inorganic surfaces. When exposed to air, the pH of newly made algal medium increased from 6.3 to 7.5 and a precipitate formed. While precipitation in the pH range 6.3-6.7 resulted in very little depletion of soluble zinc levels, up to 70 percent of the added zinc was adsorbed at pH values near 7.5. In studying loss of zinc to glassware surfaces, a linear relationship was found between percent adsorption and exposed glass surface area/pipette volume. At pH 8.0 zinc adsorption by pipettes of the size range 2-20 ml. amounted to 7-11 percent. The use of polypropylene containers was noted to reduce zinc losses significantly. It was concluded that zinc losses to inorganic surfaces could lead to considerable error if it were assumed that loss of zinc from the culture medium was due to uptake by the alga alone. (Murphy-Texas)
W73-04011

ADSORPTION AND CONCENTRATION OF DISSOLVED CARBON-14-DDT BY COLORING COLLOIDS IN SURFACE WATERS, Louisiana State Univ., New Orleans. Dept. of Biological Sciences.

For primary bibliographic entry see Field 05B. W73-04012

INDEXED BIBLIOGRAPHY OF THERMAL EFFECTS LITERATURE - 1, Oak Ridge National Lab., Tenn. Nuclear Safety Information Center. J. C. Morgan, and J. K. Franzreb. Available from the National Technical Information Service as ORNL-NSIC-81, \$3.00 in paper copy, \$0.95 in microfiche. Report ORNL-NSIC-81, December 1970. 162 p. W-7405-Eng-26.

Descriptors: *Thermal pollution, *Bibliographies, *Abstracts, *Indexing, Radioactivity, Thermal powerplants, Nuclear powerplants, Powerplants, Water pollution, Air pollution, Environmental effects, Ecosystems.

Identifiers: *Nuclear Safety Information Center, *Keywords, Thermal modifications.

The Nuclear Safety Information Center at the Oak Ridge National Laboratory is a focal point for collection, storage, evaluation, and dissemination of nuclear safety information. A system of keywords is used to index the information cataloged by the Center. The references are cataloged according to 21 categories. The last three categories added in 1969/1970 to the NSIC's subject list include: Radiation Dose to Man from Radioactivity Release to the Environment, Effects of Thermal Modifications of Ecological Systems, and Effects of Radionuclides and Ionizing Radiation and Ecological Systems. The second is the subject of this bibliography. Rapid influx of references to this category was facilitated by assimilating a card file of 1,500 references on thermal pollution from the Department of Environmental and Water Resources Engineering at Vanderbilt University and some 250 abstracts from the Water Resources Scientific Information Center. Full abstracts with keywords, followed by Keyword and Author Indices are presented. (Oleszkiewicz-Vanderbilt) W73-04020

SITING A THERMAL MULTI-PURPOSE ENERGY CENTER, Bechtel France, Paris. C. A. Scharpf. Chemical Engineering Progress, Vol 68, No 5, p 26-29, May 1972. 1 fig, 6 tab.

Descriptors: *Nuclear powerplants, *Thermal powerplants, *Economics, *Sites, *Thermal pollution, Powerplants, Heat, Temperature, Cooling, Economic efficiency, Water pollution, Environmental effects.

Identifiers: *Siting, *Waste heat, Magnehydrodynamics.

Exhaustive siting investigations play an important role in all feasibility and preliminary engineering studies involving single or dual purpose plants. Single-purpose (power-only) plants are out of date when compared economically with a modern dual-purpose nuclear plant producing energy, steam and/or other heat by-products. The main advantages of the dual purpose plant are (1) the more efficient use of the input energy with the resultant added advantage of having less heat to dissipate to surroundings and (2) the cost economics that accrue from going to larger size steam generating units. Elements of the economical evaluation procedures are outlined. (Oleszkiewicz-Vanderbilt) W73-04021

THE FOUR BIG FEARS ABOUT NUCLEAR POWER, R. E. Lapp. The New York Times Magazine, p 16-34, February 7, 1971. 5 fig.

Descriptors: *Nuclear powerplants, *Nuclear wastes, *Thermal pollution, Water pollution, Air pollution, Radioactivity, Radioactive wastes disposal, Nuclear reactors, Reactors, Fossil fuels, Public Health.

The example is cited of consolidated Edison's controversial Indian Point 783,000 kw nuclear powerplant against which a series of legal battles are fought by conservationists, ecologists and lawyers. Some answers are provided to the biggest and the most widespread fears about nuclear power. On the basis of popular drawings, functional elements of the reactor are explained, showing that a reactor cannot blow up like an A-bomb (Fear 1). Protective measures against dangerous radioactivity releases are presented (Fear 2). Methods used for safe disposal of spent radioactive nuclear fuel are demonstrated by the example of burying wastes in salt mines (Fear 3). Lastly, thermal pollution problems are discussed

and cooling principles are outlined (Fear 4). (Oleszkiewicz-Vanderbilt) W73-04022

THE NUCLEAR PLANT CONTROVERSY - II: POWER AND HOT WATER, R. E. Lapp. The New Republic, Vol 164, No 6, p 20-23, February 6, 1971.

Descriptors: *Nuclear powerplants, *Cooling, *Chesapeake Bay, *Heat, Thermal pollution, Electric power demand, Electric power production, Legislation, Thermal powerplants, Powerplants, Water pollution, Heated water. Identifiers: *Baltimore Gas and Electric Co.

The continuing battle between conservationists and Baltimore Gas and Electric Company over their \$400 million nuclear power plant under construction at Calvert Cliffs is discussed. The controversy is based on the unique nature of the Chesapeake Bay, where particularly rich biological life exists due to favorable environmental conditions. Over 3 1/2 billion gallons of heated water will be discharged daily from that facility. The problem, however, is discussed from a broader point of view. Legal, economical and environmental aspects of nuclear powerplants are discussed concluding with the idea that the United States is rapidly approaching the environmental limit that its water resources will tolerate as coolants for waste heat. By the year 2000 over 500 nuclear powerplants (based on the suggested 1,200,000 kwh power limit) will be operating. A corresponding amount of energy will be produced from fossil fuels. (Oleszkiewicz-Vanderbilt) W73-04023

POTENTIAL THERMAL EFFECTS OF AN EXPANDING POWER INDUSTRY: COLUMBIA RIVER BASIN, Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs. R. T. Jaske.

Available from the National Technical Information Service as BNWL-1646 UC-70, \$3.00 in paper copy, \$0.95 in microfiche. AED Research and Development Report BNWL-1646, UC-70, April 1972. 84 p, 25 fig, 7 tab, 2 append. AED AT (45-1)-1830.

Descriptors: *Heat, *Electric power industry, *Columbia River, *Simulation analysis, Cooling, *Thermal pollution, Powerplants, Thermal powerplants, Mathematical models, Water pollution, Nuclear powerplants, Water temperature, Washington, Oregon, Environmental effects. Identifiers: *Thermal assimilative capacity, COLHEAT simulation system.

The once-through cooling capacity of the Columbia River Basin in the reach between the International Border and Bonneville Dam (River Mile 146.4) was predicted for a number of weather conditions, flow management options, and upstream developments resulting from the Columbia Treaty Dams. The study used the MAXPWR version of the COLHEAT simulation system to locate plants and compute thermal assimilative and dissipative capacity entirely within the envelope of water quality criteria promulgated by the states of Washington and Oregon. The study reveals that under these published criteria some 20 GWe of thermal plants of 31% thermal efficiency could be sited between the International Border and the city of Pasco, Washington. An additional 10 GWe could be accommodated on the Middle Columbia above Bonneville Dam, but the operational consequence would be subject to interruption without full integration of water management in that reach. (Oleszkiewicz-Vanderbilt) W73-04024

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects of Pollution

COPING WITH HEATED WASTE WATER DISCHARGES FROM STEAM-ELECTRIC POWER PLANTS, Virginia Polytechnic Inst., Blacksburg. Center for Environmental Studies.

J. Cairns, Jr.
Bioscience, Vol 22, No 7, p 411-419, July 1972. 7 fig, 47 ref.

Descriptors: *Thermal powerplants, *Thermal pollution, *Heat, Water pollution, Powerplants, Surface waters, Heated water, Electric power production, Cooling, Beneficial use, Cooling towers, Aquatic habitats.

Identifiers: Cooling ponds, Wet cooling, Dry cooling towers.

An overall description is given of thermal pollution problems. The ever increasing power demand and existing standards established on an effluent or receiving system basis for thermal discharges are analyzed. The controversial issue of allowable mixing zones is also discussed. The environmental impact of thermal power production is presented followed by a discussion of alternative courses of action such as various beneficial uses of heat. Four types of cooling methods are described: wet cooling towers, dry cooling towers, cooling lakes and spray ponds, with cost comparisons cited. A number of steps that could help make the overall approach to environmental management and problem solving more rational are given. (Oleszkiewicz-Vanderbilt)

W73-04026

A TEMPERATURE-INDUCED TRANSITION IN MITOCHONDRIAL OXIDATION: CONTRASTS BETWEEN COLD AND WARM-BLOODED ANIMALS,

California Univ., Riverside. Dept. of Vegetable Crops.

J. M. Lyons, and J. K. Raison.
Comparative Biochemistry and Physiology, Vol 37, No 3, p 405-411, December 1, 1970. 1 fig, 1 tab, 20 ref.

Descriptors: *Animal metabolism, *Temperature, *Metabolism, Animal behavior, Animal pathology, Bioassay, Lipids, Activation energy.

Identifiers: *Mitochondrial oxidation, Cold-blooded animals, Warm-blooded animals, Transition temperature.

Anthenius plots for succinate oxidation by mitochondria from homeothermic animals indicate a phase change at approximately 23°C with an increased activation energy below this transition temperature. Similar plots for poikilotherms are continuous and linear with no change in activation energy over the entire range from 4-30°C. These results are suggested to be related to a direct response to temperature causing a configurational change of the membrane associated enzyme proteins induced by a phase change in the membrane lipids in homeotherms not observed in poikilotherms. (Oleszkiewicz-Vanderbilt)

W73-04027

MARINE LIFE IN THE MORRO BAY POWER PLANT DISCHARGE CANAL, Pacific Gas and Electric Co., Emeryville, Calif. Engineering Research Dept.

J. R. Adams.
Report 1972, 20 p, 16 photos, 1 tab, 11 ref.

Descriptors: *California, *Thermal powerplants, *Marine biology, *Aquatic habitats, *Heated waters, *Thermal pollution, Water pollution, Pacific Ocean, Marine animals, Marine plants, Marine fish.

Identifiers: *Morro Bay Power Plant, Thermal discharges, Discharge canal.

At the Morro Bay Power Plant, located about halfway between San Francisco and Los Angeles on

the California coast, the ocean water used for cooling is frequently warmed 15-23 deg F above the normal sea temperature. The warmed water is returned to the ocean through a discharge canal just north of Morro Rock. The clear waters of the Morro Bay area afford an unusual opportunity to view the variety of marine life present in the artificially warmed water of the discharge canal. Many of these plants and animals are attached to the rocks, so that they are exposed to all aspects of the operation of the power plant. Some 110 species of plant and animal life have been observed in the canal. A complete species list is enclosed. About one-third of these 110 species, such as crabs, starfish, and fish, could have entered from the ocean end of the discharge canal. However, most of the species came through the cooling water system of the power plant at some stage of their life history, because the flow in the canal is too strong for anything except a good swimmer. (Oleszkiewicz-Vanderbilt)

W73-04031

MERCURY IN FISH - TOTAL CONTENT IN FRESHWATER AND MARINE FISHES (VII. TOTAAL KWIKGEHALTE VAN ZOET-WATEREN ZEEVIS), Rijksinstituut voor de Volksgezondheid, Utrecht, (Netherlands).

P. A. Greve.
TNO-nieuws, Vol 26, p 395-399, 1971. 4 fig, 2 tab.

Descriptors: *Mercury, *Fish, *Freshwater fish, *Marine fish, *Path of pollutants, Water pollution, Eels, Bass, Pollutant identification.

Identifiers: *Biological accumulation factor, *Holland.

Several marine and freshwater fish were analyzed for mercury content. In freshwater fish a dependence on place of origin was found. IJsselmeer eel had more mercury than eels from other sources, averaging 0.5 ppm Hg. The biological accumulation factor for eel was found to be equal to 1000. In other words, a 0.1 ppb Hg concentration in water would produce 0.1 ppm Hg in an eel. Similar factors have been found by Swedish researchers for pike and bass. Swedish standards for mercury content in fish tissue (1.0 ppm Hg) versus American standards (0.5 ppm Hg) are discussed. (See also W73-04045) (Oleszkiewicz-Vanderbilt)

W73-04044

MERCURY IN FISH - IMPORTED TINNED FISH, (IX. KWIKGEHALTEN VAN EEN AAN-TAL SORTEEN INGEBLIKTE VIS), Interuniversitair Reactor Instituut, Delft (Netherlands).

J. J. M. De Goeij, and C. Zegers.
TNO-nieuws, Vol 26, p 400-401, 1971. 2 tab, 15 ref.

Descriptors: *Mercury, *Fish, *Foods, Tuna, Gas chromatography, Water pollution, Trace elements, Neutron activation analysis, Environmental effects, Path of pollutants, Analytical techniques, Herrings, *Pollutant identification.

Identifiers: *Methyl mercury, Canned fish, Holland, Mackerel.

The research study dealt with mercury content in the tissue of the six most commonly consumed fish imported in cans from several countries in Europe, the Americas and Asia. The cans analyzed were purchased at a department store. Total mercury was analyzed by neutron activation analysis on homogenized samples. Methyl mercury was determined by means of gas chromatography. Mercury content ranged from 0.01 to 0.1 ppm in salmon, mackerel, herring and sardines. Tuna showed a range of 0.032-1.0 ppm Hg. Methyl mercury constituted 80% of total mercury. The country of origin did not influence the mercury content and there was no accumulation in any particular organ in excess of the contents in the meat tissue. (See also W73-04044) (Oleszkiewicz-Vanderbilt)

W73-04045

LEGACY OF THE MAD HATTER, Washington Univ., St. Louis, Mo. School of Medicine.

N. Grant.

Environment, Vol 11, No 4, p 18-23, 43, 44, May 1969. 1 fig, 3 photos, 22 ref.

Descriptors: *Mercury, *Toxicity, *Water pollution effects, Heavy metals, Public health, Human pathology, Lethal limit, Biological membranes, Absorption, Water pollution sources, Food, Water quality standards, Industrial wastes.

Identifiers: *Methylmercury, Biomethylation, Biotransformation, Body burden.

Transformations of mercury from one form to another can give confusing toxicity, body distribution, accumulation and excretion characteristics in mercury poisoning even though the original form of mercury emitted to the environment is known. Inorganic mercury poisoning can occur in many industries such as those which manufacture scientific instruments and hospitals and laboratories which use mercury. It can cause kidney damage, loss of coordination, diarrhea, and mental disturbance. Aryl salts of mercury appear to break down readily into inorganic mercury which is accumulated in the kidney and excreted in the feces. Alkymercury compounds are more evenly distributed throughout the body and can diffuse through biological membranes more easily than other mercury compounds can. Early symptoms are nonspecific, and later tremor, numbness of extremities, blurred vision, loss of muscular coordination and emotional disturbance occur. Statistics on the occurrence of mercury poisoning are not available due to failure to report cases, failure to verify the source of symptoms, and failure to recognize cases. Sources of organic mercury concentrated through the food chain include fish, eggs, and meat. Difficulties in determining a safe level of intake are discussed. (Eagle-Vanderbilt)

W73-04048

BIRDS GIVE WARNING, Stockholm Univ. (Sweden). Dept. of Biochemistry.

G. Lofroth, and M. E. Duffy.

Environment, Vol 11, No 4, p 10-17, May 1969. 1 fig, 1 tab, 3 photos, 58 ref.

Descriptors: *Mercury, *Birds, *Fish, *Water pollution, Water pollution sources, Seed treatment, Sediments, Pollution abatement, Toxicity, Standards, Path of pollutants.

Identifiers: *Methylmercury, *Biomethylation, *Sweden, *Japan, Eggs, Meat.

The history of methylmercury poisoning in Japan is outlined. The compound was traced from discharges of an industrial plant, to the water, to fish, and finally to people. These incidents caused alarm in Sweden where methylmercury used as a fungicide on seeds had been killing birds which ate the treated seed. Eggs, meat, and fish were analyzed in Sweden and found to have higher mercury contents than those in other nearby European countries. After revocation of the license for all alkymercury compounds in agriculture, the mercury content of Swedish eggs and meat has decreased. Present mercury contamination comes from industrial discharge of inorganic mercury. Sources include pulp factories, chlorine factories, electrical industries, the burning of fossil fuels, and sewage sludge. Even though the mercury discharged is inorganic, it can be converted biologically to methylmercury. This makes the pollution more persistent when methylmercury can be produced from old industrial discharges even if no more mercury were released now. To prevent methylmercury contamination of fish, either the mercury in sediments must be removed or it must be tied up so that organisms cannot convert it.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Effects of Pollution—Group 5C

Meanwhile limits are set on the permissible level of mercury in fish that are sold. (Eagle-Vanderbilt) W73-04049

A PHYSICOCHEMICAL RATIONALE FOR THE BIOLOGICAL ACTIVITY OF MERCURY AND ITS COMPOUNDS, Brookhaven National Lab., Upton, N.Y.

W. L. Hughes.
Annals New York Academy of Sciences, Vol 65, Article 5, p 454-460, April 11, 1957. 3 tab, 17 ref.

Descriptors: *Mercury, *Heavy metals, Public health, Biology, Biological properties, Chemistry, Physicochemical properties.

Identifiers: *Pharmacology, *Medicine, Affinity, Organic mercurials, Mercaptides, Biological activity.

The biological effect of mercury has been found to vary according to the nature of the chemical compound administered. The concept is developed that in all cases the principal reaction is with thiols (that is, the formation of mercury mercaptide) and that the variations in distribution and effect are dependent upon this reaction. This is not a new concept; the affinity of mercury for sulfur was known to the alchemists. However, since the extreme specificity of this reaction is sometimes lost sight of today, it should be documented. Some general principles exist for predicting the pharmacological behavior of mercurials and mercaptide formation is a fundamental concept. Nevertheless, sulphydryl groups occur so widely in proteins and with such varying affinities for mercury that the pharmacologically active sites are not yet known. (Oleszkiewicz-Vanderbilt) W73-04054

FACTORS AFFECTING PLANT UPTAKE AND PHYTOTOXICITY OF CADMIUM ADDED TO SOILS,

Department of Agriculture, Agassiz (British Columbia). Research Station.
For primary bibliographic entry see Field 05B. W73-04058

MERCURY CONCENTRATION IN RECENT AND NINETY-YEAR-OLD BENTHOPELAGIC FISH,

Duke Univ., Beaufort, N.C. Marine Lab.
For primary bibliographic entry see Field 05B. W73-04122

CONCENTRATION FACTORS OF CHEMICAL ELEMENTS IN EDIBLE AQUATIC ORGANISMS,

California Univ., Livermore. Lawrence Radiation Lab.
W. H. Chapman, H. L. Fisher, and M. W. Pratt.
Publication No UCRL-50564, December 30, 1968. 50 p, 15 tab, 130 ref.

Descriptors: *Aquatic animals, *Aquatic plants, *Elements (Chemical), Fish, Foods, Water pollution, Mercury, Heavy metals, Radioactivity, Plants, Invertebrates, Oysters.
Identifiers: *Concentration factor, *Edible aquatic organisms, Radioactive elements.

Tables are presented of concentration factors for edible plants, invertebrates, and fish (for both salt and fresh water), based on an extensive review of the stable element data available in the literature. The concentration factor (CF) for any element is defined by the ratio of the concentration of an element in aquatic organism in ppm (wet weight) to the concentration of the element in water (ppm). The raw data from which the concentration factors were derived are included in an appendix, as well as the methods employed in estimating the concentration of elements in those situations where there was an absence or paucity of information available. (Oleszkiewicz-Vanderbilt)

W73-04125

METHYLMERCURY, A REVIEW OF HEALTH HAZARDS AND SIDE EFFECTS ASSOCIATED WITH THE EMISSION OF MERCURY INTO NATURAL SYSTEMS,

Stockholm Univ. (Sweden). Dept. of Biochemistry, G. Loefroth.
Natural Science Research Council, Ecological Research Committee, Stockholm, Sweden, Bulletin 4, September 1970. 59 p, 4 fig, 9 tab, 3 maps, 111 ref.

Descriptors: *Mercury, *Environment, *Fish, Toxicity, Water pollution, Metabolism, Genetics, Heavy metals, Public health, Human pathology, Poisons, *Reviews.

Identifiers: *Methylmercury, Half-life.

Health hazards and side effects associated with the discharge of mercury compounds into natural systems are reviewed. Accidental poisoning in man by consumption of methylmercury dressed seeds has occurred. Water and airborne pollution by any mercury compound presents problems of large magnitude as mercury can be methylated biologically in several ecosystems. The most important effects of methylmercury to be screened for are the selective destruction of certain brain cells and the C-mitotic action on dividing cells. The data presently available indicate that the human fetus might be visibly affected at a methylmercury intake by the mother-to-be several times less than the intake which would affect non-pregnant adults. Methylmercury seems to have a biological half-life on the order of 70-200 days in man. The official Swedish legal limit in fish is 1 mg/Hg/kg tissue, with a recommendation to limit the consumption of fish to one meal a week. (Upadhyaya-Vanderbilt) W73-04127

INHIBITION OF OLIGOMYCIN-SENSITIVE AND -INSENSITIVE MAGNESIUM ADENOSINE TRIPHOSPHATE ACTIVITY IN FISH BY POLYCHLORINATED BIPHENYLS,

Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries and Wildlife.

D. Desaiyah, L. K. Cutkomp, H. H. Yap, and R. B. Koch.
Biochem Pharmacol, Vol 21, No 6, p 857-865, 1972, illus.

Identifiers: *ATPase, Brain, Fish, Inhibition, In-

sensitive, Ions, Magnesium, Mitochondria,

Muscle, *Oligomycin, Phenyls, Potassium, Sodium, *Polychlorinated biphenyls.

Polychlorinated biphenyls (PCBs) are being used widely in industry as plasticizers in paints, resins and plastics, as well as insulators and heat exchange fluids. Some of these chemicals also are being released into the environment as industrial wastes. Tests in vitro with 4 PCBs on 4 tissues of fish showed prominent inhibitory effects on oligomycin-insensitive Mg²⁺-ATPase, with muscle homogenate being most sensitive. Aroclor 1242 and 1254 in the intermediate range of chlorination, were more effective than 1221 and 1268. Mg²⁺-ATPase from mitochondria was not as sensitive to the PCBs when compared with DDT-type compounds which were more effective on mitochondrial Mg²⁺-ATPase than on oligomycin-sensitive Mg²⁺-ATPase. Some stimulation of Mg²⁺-ATPase was evident from the poorest inhibitors, Aroclors 1221 and 1268. Na⁺-K⁺ ATPase from fish brain homogenate was inhibited by Aroclor 1242 but the dose required was several times that for Mg²⁺-ATPase. (Copyright 1972, Biological Abstracts, Inc.) W73-04176

A SHELLFISH-BORNE CHOLERA OUTBREAK IN MALAYSIA,
North Dakota Univ., Grand Forks. School of Medicine.

A. K. Dutt, Syed Alwi, and T. Velauthan.

Trans R Soc Trop Med Hyg, Vol 65, No 6, p 815-818, 1971.

Identifiers: *Cholera, *Malaysia, *Shellfish-Borne diseases, Strains, Transmission (Disease), Public health.

A bacteriological study of 11,650 El Tor specimens was done. El Tor Inaba strains (139) were isolated from the stool of suspected patients and contacts, from water of various wells and tributaries of Kelantan river, and from shellfish. Twenty-five nonagglutinable and 10 partially-agglutinable and auto-agglutinable (rough) strains were demonstrated in edible types of shellfish. Nonagglutinable vibrios (55) were isolated from stools of suspected patients, from shellfish and water, and were regarded as pathogenic. Shellfish and water were considered as predominant vehicles for the transmission of cholera of this outbreak. The short-term carrier state is emphasized and the causal relationship of cholera with carrier was insignificant in this outbreak. (Copyright 1972, Biological Abstracts, Inc.) W73-04182

EVALUATION OF HERBICIDES FOR POSSIBLE MUTAGENIC PROPERTIES,

Battelle Memorial Inst., Ohio. Columbus Labs.

K. J. Andersen, E. G. Leighty, and M. T. Takashashi.

Journal of Agricultural and Food Chemistry, Vol 20, No 3, p 649-656, May/June 1972. 7 tab, 17 ref.

Descriptors: *Herbicides, *Evaluation, Bioassay, Water pollution effects, E. coli, Chromosomes, *Bacteriophage, Carbamate pesticides, Thiocarbamate pesticides, Phosphothioate pesticides, Chlorinated hydrocarbon pesticides, Triazine pesticides, Triazole pesticides, Urea pesticides, Phenolic pesticides, Pyridine pesticides, Sulfur compounds, Inorganic pesticides, Uracil pesticides, Genetics, Viruses, 2,4-D, Dalapon, Diquat, 2,4,5-T, M.

Identifiers: *Mutagenicity, Mutation, *Mutants, *Salmonella typhimurium.

One-hundred-and-ten herbicides were evaluated for their ability to induce point mutations in one or more of four different microbial systems (eight histidine - requiring mutants of salmonella typhimurium, bacteriophage T4, and two rII mutants of T4). None of the herbicides appeared to cause point mutations in these microbial systems in comparison with known mutagens such as 5-bromouracil or 2-amino-purine. Except for inconclusive evidence relating to four herbicides within one test of one system, mutagenic rates of herbicide-treated organisms did not differ significantly from spontaneous rates. In this one test, four herbicides were associated with mutation frequencies slightly in excess of the control. The observed increases were small, and the rates of mutation were lower than spontaneous rates of controls in other tests of the same system. Therefore, it appears that the increases observed with these four herbicides were within the normal range of spontaneous rates. (Byrd-Battelle) W73-04233

MICROBIOLOGY OF WATER,

Environmental Protection Agency, Cincinnati, Ohio.

For primary bibliographic entry see Field 05B. W73-04235

EFFECTS ON FRESHWATER FISH,

Washington Univ., Seattle.
M. Katz, R. S. LeGore, D. Weitkamp, J. M. Cummins, and D. Anderson.

Journal Water Pollution Control Federation, Vol 44, No 6, p 1226-1250, June 1972. 254 ref.

Descriptors: *Freshwater fish, *Water pollution effects, *Reviews, Respiration, Enzymes,

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects of Pollution

Hydrogen ion concentration, Perches, Heavy metals, Water pollution, Freshwater, Toxicity, Detergents, Pollutants, Insecticides, Industrial wastes, Herbicides, Chlorinated hydrocarbon pesticides, Pulp wastes, Organic wastes, Dissolved oxygen, Carbon dioxide, Hydrogen sulfide, Water temperature, Salmon, Shellfish, Worms, Benthic fauna, Ammonia.

Identifiers: *Heathcote River, Parathon, Thin layer chromatography, *Salvelinus fontinalis*, *Cyprinus carpio*, *Daphnia magna*, *Salmo trutta*, *Peprilus promelas*, *Lepomis macrochirus*, Fathead minnow, Pickerel, *Fundulus grandis*, *Iulus idus*, *Rhodus amarus*, *Ictalurus nebulosus*, *Gillichthys mirabilis*, Mudsuckers, *Vibrio anguillarum*, *Aeromonas liquefaciens*.

A literature survey is presented of the effects of water pollutants on freshwater fish. Some of the items include: (1) completed tests used to determine the lethality of estuarine and some polluted river waters to trout and cyprinids; (2) estimated degrees of pollution of the Heathcote River obtained from bacterial and chemical analysis of water samples; (3) documentation of some of the effects of municipal wastewater effluents on the water quality, fish populations, and bottom fauna characteristics of a receiving stream; and (4) observations of the aquatic environmental effects of such pollutants as synthetic detergents, industrial pollutants, insecticides, herbicides, and pesticides. (Byrd-Battelle)

W73-0426

WATER POLLUTION. FRESHWATER MACROINVERTEBRATES, Environmental Protection Agency, Washington, D.C., Office of Water Programs. K. M. Mackenthun and L. E. Keup. Journal Water Pollution Control Federation, Vol 44, No 6, p 1137-1150, June 1972. 153 ref.

Descriptors: *Water pollution effects, *Reviews, Water pollution sources, Aquatic environment, Habitats, Environmental effects, Industrial wastes, Pesticides, Radioactivity, Distribution, Food webs, Sampling, Aquatic drift, Pollutants, Water pollution, Ecology, Wastes, Mine wastes, Chemical wastes, Acid mine water, Inorganic compounds, Metals, Copper.

Identifiers: *Macroinvertebrates, Periodicity, Alkaline sulfonate, Methylparathion, Chlordane, Sevin, TFM, Silvex, Zn-65, Coho Salmon, Tadpoles, Trichoptera, Blackflies, Scud, Sowbugs, Drift organisms, Leeches, Campeloma decisum, *Gammarus pseudolimnaeus*, *Physa integra*, *Sphaerocilis*, *Palae monetes*, *Pteronarcys dorsata*, *Dugesia*, *Cheumatopsyche*, *Hexagenia bilineata*.

A literature review is presented on the effects of various pollutants on macroinvertebrates. Brief discussions cover pollutant types such as inorganic wastes, organic wastes, pesticides, and radioactive wastes; environmental alterations such as enrichment; distribution, life histories, habitats; periodicity and drift of organisms; food webs; and sampling techniques. (Mackan-Battelle)

W73-0428

THE INSTABILITY OF OCEAN POPULATIONS, Institute for Marine Environmental Research, Plymouth (England). A. Longhurst, M. Colebrook, J. Gulland, R. Le Brasseur, and C. Lorenzen. New Scientist, Vol 54, No 798, p 500-592, June 1, 1972. 4 fig.

Descriptors: *Population, *Oceans, *Water pollution effects, *Biomass, Aquatic populations, Distribution patterns, Bioindicators, Fish, Marine animals, Marine fish, Plankton, Weather, Water temperature, Analytical techniques.

Identifiers: *Data interpretation, Biomonitoring.

Data on collapses or declines in populations of marine organisms are not necessarily valid indicators of the effects of ocean pollution. Several such cases have been shown to result not from contamination of the ocean, but rather from direct and indirect climatic effects. Conversely, it has also been shown that marine populations in polluted areas fluctuate within usual limits. It is concluded, therefore, that pollution monitoring schemes, in the ocean or elsewhere, can only succeed if the natural effects of the changing physical environment are both understood and monitored continuously and indefinitely. Natural fluctuations in animal populations have already been ascribed incorrectly to the effects of pollutants, and it would be easy for a serious impact on the environment to pass unnoticed through ignorance of natural population instability or a lack of monitoring of the oceans on a global scale. (Little-Battelle)

W73-0420

NOTES ON A MANGROVE LAGOON AND MANGROVE CHANNELS AT LA PARGUERA, PUERTO RICO, Puerto Rico Univ., Mayaguez. Dept. of Marine Sciences.

L. R. Almodovar, and F. A. Pagan. Nova Hedwigia, Vol 21, No 1, p 241-253, 1971. 4 fig, 2 diagrams, 14 ref.

Descriptors: *Salinity, *Water temperature, *Marine algae, *Food chains, *Distribution patterns, *Mangrove swamps, Sampling, Artificial substrates, Benthic flora, Sessile algae, Chlorophyll, Ecology, Fish, Water quality, Population, *Puerto Rico.

Identifiers: *Species diversity, *Acetabularia crenulata*, *Batophora cerstedi*, *Anadyomene stellata*, *Udotea flabellum*.

The high salinity lagoon and mangrove swamp areas near La Parguera, Puerto Rico were studied to elucidate some aspects of the biology, distribution, ecology, and other factors related to benthic marine algae. Algae were collected by placing concrete blocks in the lagoon for a six-month period. Fish were also collected and their stomach contents analyzed. The algal collections showed that submerged vegetation in the lagoon is restricted to four green algae, *Acetabularia crenulata*, *Batophora cerstedi*, *Anadyomene stellata*, and *Udotea flabellum*. Due to the limited number of species present, attempts were made to transplant other species. However, all except one (*Halimedea opuntia*) died within two weeks. Analysis of fish showed that algae found in the stomachs were eaten outside the lagoon. It is a fish diet not account for the absence of a greater variety of algae in the lagoons; instead, factors such as salinity and water temperature are higher than normal for optimum growth. Salinity and temperature in the channels were found to be at normal levels and algal vegetation attached to rhizophores was plentiful, although limited to a few species. (Little-Battelle)

EFFECTS OF ACCLIMATION AND ACUTE TEMPERATURE EXPERIENCE ON THE SWIMMING SPEED OF JUVENILE COHO SALMON, Fisheries Research Board of Canada, Nanaimo (British Columbia), Biological Station. J. S. Griffiths, and D. F. Alderdice. Journal of the Fisheries Research Board of Canada, Vol 29, No 3, p 251-264, March 1972. 9 fig, 2 tab, 16 ref.

Descriptors: *Swimming, *Velocity, *Fish behavior, Adaptation, *Water temperature, Water pollution effects, Mortality, Juvenile growth stage, Smolt, Thermal stress, *Salmon.

Identifiers: *Acclimation, *Oncorhynchus kisutch*, Thermal tolerance, *Coho salmon.

Juvenile coho salmon were studied to determine the effects of acclimation and acute temperature experience on swimming speed. Swimming performance of juvenile coho salmon (*Oncorhynchus kisutch*), 7.5-9.5 cm in total length, was investigated in a stamina tunnel, generally at 3°C intervals of temperature over the range of thermal tolerance. Optimum (ultimate maximum) performance (5.8 lengths/sec) occurred at a combination of acclimation and test temperatures near 20°C. A declining ridge of sub-optimum performance (test temperature ridge) was found at acclimation temperatures below 20°C; maximum performance at each acclimation temperature level was found on the ridge at test temperatures higher than those of acclimation. Conversely, maximum performance at given test temperatures occurred on a second ridge (acclimation temperature ridge) at acclimation temperatures near those of testing. There was an apparent shift in location of the acclimation temperature ridge, indicative of seasonal performance compensation and improved capacity to perform at low acclimation temperatures during the winter period. At test temperatures below 5°C, maximum performance occurred at acclimation temperatures of about 6-8°C. Lowest performance within the zone of thermal tolerance was associated with acclimation and test temperatures of 2°C. (Byrd-Battelle)

W73-0423

FLOCCULANT PRODUCTION FROM KEROSENE,

University of Western Ontario, London. Dept. of Bioengineering.

For primary bibliographic entry see Field 05B.

W73-0424

CHANGES OF VASCULAR AQUATIC FLOWERING PLANTS DURING 70 YEARS IN PUT-IN-BAY HARBOR, LAKE ERIE, OHIO, Ohio State Univ., Columbus. Coll. of Biological Sciences.

R. L. Stuckey.

Ohio J Sci. Vol 70, No 6, p 321-343, 1971. Illus.

Identifiers: Aquatic plants, Harbors, Lakes, *Ohio, Oxygen, Put-in-Bay, Runoff, Sewage, Temperature, Turbidity, *Vascular plants, *Lake Erie.

Based on a survey in 1898, 40 spp. of vascular aquatic flowering plants were reported for Put-in-Bay harbor in western Lake Erie. Studies of this flora at various times since then have revealed a loss of species from this harbor to the extent that today 20 spp. of the original 40, or 50%, of the flora has disappeared. Only 3 of the original 40 can be considered to be common or abundant today in the harbor. During the same 70-yr period, only 4 submersed species have invaded the harbor. Increase in water temperature, decrease in oxygen, increase in turbidity, and man's influence on the harbor by dredging, building retaining walls, increasing use of motor boats, dumping of domestic sewage, and runoff from agricultural land are all considered as possible factors that have, independently and interrelatedly, in part or in total, been responsible for this 50% loss in species composition. Comparisons with data from studies of Lake East Okoboji, Iowa, and University Bay in Lake Mendota, Wisconsin, reveal that the changes in species composition of the aquatic flora in Put-in-Bay harbor are very similar to those changes that have occurred in Lake East Okoboji, and that a trend similar to that in Put-in-Bay harbor and Lake East Okoboji is developing in University Bay of Lake Mendota. Species characteristic of clear, cool, well-oxygenated waters, whose distributions are primarily northern and whose ecological tolerances are apparently narrow, have disappeared, whereas species of turbid, warm poorly oxygenated waters, whose distributions are primarily widespread and whose ecological tolerances are apparently wide, have survived.—Copyright 1972, Biological Abstracts, Inc.

W73-0428

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Effects of Pollution—Group 5C

LAMPREYS AND TELEOST FISH, OTHER THAN WHITEBAIT, IN THE POLLUTED THAMES ESTUARY.

Kings Coll., London (England). Dept. of Zoology. R. Huddart, and D. R. Arthur. Int J Environ Stud. Vol 2, No 2, p 143-152. 1971. Illus.

Identifiers: *Clupea-harengus*, *Crankon-vulgaris*, England, Fish, "Lampreys, Polluted estuary, *Sprattus-sprattus*, "Teleost fish, "Thames estuary, Whitebait, Estuaries.

In a previous paper by Huddart and Arthur the methods used in sampling the fauna of the Thames off West Thurrock Power Station were described. The results in respect of shrimps (*Crangon vulgaris*) and whitebait (a mixture of young herring (*Clupea harengus*) and sprats (*Sprattus sprattus*)) are also reported in this paper. The present contribution relates to the occurrence of lampreys and teleosts, other than whitebait, which were sampled contemporaneously. These results may serve as a base line for measuring further changes in the fauna of the Thames estuary arising from further possible industrial development and the erection of a barrage.—Copyright 1972, Biological Abstracts, Inc.

W73-04262

SELENIUM ACCUMULATION IN SOILS AND IT'S ABSORPTION BY PLANTS AND ANIMALS,

Geological Survey, Denver, Colo.

H. W. Lakin.

Geol Soc Am Bull. Vol 83, No 1, p 181-190. 1972. Illus.

Identifiers: Soil chemical properties, Absorption, Accumulation, Animals, Crops, Plants, "Selenium, Soils, Toxicity, Public health.

Soils producing crop plants that are toxic because of selenium are confined to small areas, but occur throughout the world. Such soils are confined to semiarid regions or areas of impeded drainage. They contribute no significant hazard to human health and only locally to animal health. Environmental contamination with Se is increasing, but will probably stay well below a hazardous concentration. Locally, mining and industrial wastes may produce minor hazards. However, the effect of added Se in the atmosphere and waters in combination with other contaminants is not known and should be studied.—Copyright 1972, Biological Abstracts, Inc.

W73-04272

THE DOSE TO MAN FROM ATMOSPHERIC KR-45,

Pennsylvania State Univ., University Park. Dept. of Nuclear Engineering.

For primary bibliographic entry see Field 05B.

W73-04291

RADIOACTIVE WASTE REPOSITORY PROJECT; ANNUAL PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 30, 1972, Oak Ridge National Lab., Tenn.

For primary bibliographic entry see Field 05B.

W73-04294

RADIOECOLOGY AND ECOPHYSIOLOGY OF DESERT PLANTS AT THE NEVADA TEST SITE,

California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology. A. Wallace, and E. M. Romney.

Available from NTIS, Springfield, Va., as TID-25954; \$6.00 paper copy, \$0.95 in microfiche. Report TID-25954, 1972. 439 p.

Identifiers: "Botanicals, "Irrigation effects, Desert plants, "Nuclear wastes, Strontium radioisotopes, Cobalt radioisotopes, Retention, Absorption, Radioactivity effects, Vegetation

regrowth, Lead, Cycling nutrients, Speciation, Salt tolerance, Flood damage, Sampling, Radioecology, Ecology, Plant physiology.

Reports are presented on 53 research topics. A 740-reference bibliography is assembled as an aid for future work. Disciplines include soil science, plant nutrition, statistics, horticulture, and plant physiology. Among the topics are: persistence of radionuclides, revegetation, speciation, primary productivity, temperature effects, roadside uptake of Pb, computer-designed sampling, effects of an artificial stream, interception of rain by foliage, supplemental moisture and fertilizer, salt tolerance, and flood damage. (Bopp-ORNL) W73-04300

RADIONUCLIDES IN LAKE MICHIGAN FISH, Argonne National Lab., Ill.

For primary bibliographic entry see Field 05A.

W73-04306

STABLE ELEMENT CONCENTRATIONS AND ESTIMATIONS OF THE RADIONUCLIDE CONTENTS IN THE FISH AND INVERTEBRATES SAMPLED FROM THE WATERS ADJACENT TO PANAMA AND COLUMBIA,

Puerto Rico Nuclear Center, Mayaguez.

F. G. Lowman, J. H. Martin, R. Y. Ting, S. S. Barnes, and D. J. P. Swift.

Report available from NTIS as BMI-171-32 (Vol. 3); \$3.00 in paper copy, \$0.95 in microfiche. In: Battelle Memorial Inst. Report 171-32, June 1970, Vol 3, Appendix F, p 2.

Identifiers: *Food chains, *Public health, *Canal construction, *Nuclear explosions, Radioactivity effects, Water pollution effects, Feasibility studies, Baseline studies, Estuarine environment, Gulfs, Trace elements, Radioisotopes, Marine animals, Waste dilution, Fallout, Analytical techniques, Sampling.

Identifiers: *Caribbean Sea, *Gulf of Panama.

Measurements of biologically important stable elements (Zn, Fe, Mn, Ca, Sr, Sc, C, H, and N) in conjunction with predictions of specific activity are used to estimate radionuclides in marine foods (resulting from construction of the proposed canal by nuclear explosions). Analytical and sampling methods are described briefly. (See also W72-04940 and W73-04308) (Bopp-ORNL) W73-04307

CHARACTERIZATION OF THE SEDIMENTS FROM THE TUIRA AND SABANA RIVER ESTUARIES,

Puerto Rico Nuclear Center, Mayaguez.

G. Telek, and D. J. P. Swift.

Report available from NTIS, Springfield, Va., as BMI-171-32 (Vol. 4); \$3.00 paper copy, \$0.95 in microfiche. In: Battelle Memorial Inst. Report 171-32, June 1970, Vol 4, Appendix J, p 3.

Identifiers: *Feasibility studies, *Sediments, Trace elements, *Canal construction, Environmental effects, Public health, Radioactivity effects, Baseline studies, Leaching, Rivers, Carbonates, Estuarine environment, Gulfs.

Identifiers: *Caribbean Sea, *Gulf of Panama.

River sediments along the route of a proposed canal were analyzed, during wet and dry seasons, for Ca, Zn, Fe, Mn, carbonate, sand, silt, and organic C. Mollusks produced a higher Ca content of river-mouth sediments (1%) as compared with head-of-tide sediments (0.18%). The presence of biogenic carbonates produced 22% Ca in sediments from the middle of the Gulf of Panama. The lower Mn content of river sediments (0.051%) as compared with Gulf sediments (0.5%) was produced by greater leaching in the reducing (high C) environment in the rivers. (See also W73-04307) (Bopp-ORNL) W73-04308

OUTCRY OVER EXPOSURE GUIDELINES, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 05G. W73-04314

BIOENVIRONMENTAL SAFETY STUDIES, AMCHITKA ISLAND, ALASKA. CANNIKIN D + 2 MONTHS REPORT,

Battelle Columbus Lab., Ohio.

J. B. Kirkwood, and R. G. Fuller. Available from NTIS, Springfield, Va., as report No. BMI-171-147, \$3.00 in paper copy; \$0.95 in microfiche. Report No. BMI-171-147, June 1972. 100 p., 34 fig, 18 tab, 21 ref, 6 append.

Identifiers: *Nuclear explosions, *Nuclear engineering, *Underground, Seismic studies, Ecosystems, Biological communities, Turbulence, Marine algae, Marine animals, Marine fish, Mortality, Fish kill, Aquatic animals, Water birds, Sea walls.

Cannikin, an underground nuclear test of less than 5 megatons was fired on November 6, 1971, at Amchitka Island, Alaska. Pre- and postevent studies were conducted to assess the effects of Cannikin on the Amchitka ecosystems. Preliminary evaluation of those effects is presented, based on analysis of data collected during the first 2 months after the test, supplemented in a few instances by more current information. Individuals of several species of marine mammals, waterfowl, and marine and freshwater fish were killed by the test, but no animal population on or around the Island was jeopardized. The total numbers killed can only be estimated, and the reliability of the estimation is generally low because stormy weather around test time hampered observation and recovery of casualties, especially in the marine environment. (Houser-ORNL) W73-04317

THE 1971 TRITIUM SYMPOSIUM AT LAS VEGAS,

Oak Ridge National Lab., Tenn.

For primary bibliographic entry see Field 05A.

W73-04318

MATHEMATICAL MODEL OF THE ECOLOGICAL SYSTEM OF LAKE DRIVYATY, (IN RUSSIAN),

Akademija Nauk SSSR, Leningrad. Institut Evoljutsionnoj Fiziologii i Biokhimii.

V. V. Menshutkin, and A. A. Umnov.

Ekologiya. Vol 1, No 4, p 3-10, 1970. Illus.

Identifiers: Computer models, *Ecological studies, Lakes, *Mathematical models, USSR, "Lake Drivaty.

A mathematical model of a lake ecosystem is presented. The model is implemented on a digital computer and based on the energy relationships between trophic elements of the ecosystem. An investigation of the model yielded a satisfactory agreement between the model data and the results of direct observations on the lake.—Copyright 1972, Biological Abstracts, Inc.

W73-04321

SEASONAL CONCENTRATION, TURNOVER, AND MODE OF ACCUMULATION OF P32 BY THE JUVENILE STARRY FLounder IN THE COLUMBIA RIVER ESTUARY, PLATICHTHYS STELLATUS (PALLAS),

Oregon State Univ., Corvallis.

J. J. Bolen. Available from NTIS, Springfield, Va., as RLO-2227-T-12-33; \$3.00 in paper copy, \$0.95 in microfiche. Report RLO-2227-T-12-33, October 1971. 142p, 23 fig, 9 tab, 87 ref. (Ph. D. Thesis, June 1972).

Identifiers: *Phosphorus radioisotopes, *Marine fish, *Food chains, *Estuarine environment,

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects of Pollution

Columbia River, Animal metabolism, Absorption, Seasonal, Radioecology, Phosphorus, Path of pollutants, Temperature, Rivers, Water pollution effects, Radioactivity effects, Amphipoda, Isopods.

The effect of water temperature on metabolism gave generally low p32 concentration factors and specific activities in winter and fall. (The concentration factor ranged from a low of 600 to a high of 200,000.) The spring maximum was followed by an early summer decline from the effect of the spring freshet on the P32 concentration in water and on the fish's ability to obtain food. The increase after the spring flood was arrested by the intrusion of lower-temperature sea water later in the summer. Uptake by caged fish from water averaged 24% of that from food plus water. Fish assimilated about 16% of the P32 in the amphipod-isopod food. (Bopp-ORNL) W73-04322

TEMPERATURE TOLERANCE OF PATHOGENIC AND NONPATHOGENIC FREE-LIVING AMOEBAE,
Armed Forces Inst. of Pathology, Washington, D.C.

J. L. Griffin.
Science, Vol 178, p 869-870, November 24, 1972. 1 fig, 22 ref.

Descriptors: *Temperature, *Growth rates, *Thermal pollution, Coliforms, Aquatic microorganisms, Laboratory tests, Cultures, Water sports, Water pollution.

Identifiers: *Amoebas, *Pathogenicity.

Primary amoebic meningoencephalitis is a fatal human disease in which fresh-water amoebas invade the brain. Within tested strains of the genera Naegleria and Acanthamoeba the ability to grow at high temperatures seems directly related to virulence, with nonvirulent strains unable to grow at normal or elevated body temperatures. Outside these genera, nonvirulent Hartmannella and Tetramitus do grow at elevated temperatures, which suggest a barrier to pathogenicity other than temperature sensitivity. The high optimal temperature of pathogenic Naegleria apparently explains previous difficulty in obtaining isolates from the aquatic environment. The results suggest that combined coliform and thermal pollution would stimulate the growth of *N. fowleri*, but environmental data are lacking. (Eagle-Vanderbilt) W73-04330

THERMAL EFFECTS STUDIES ON THE LOWER COLUMBIA RIVER, 1968-70,
Bureau of Commercial Fisheries, Seattle, Wash.
G. R. Snyder, D. R. Craddock, and T. H. Blahm.
In: Proceedings of the Western Association of State Game and Fish Commissioners, 30th Conference, Victoria, British Columbia, July 13-16, 1970, p 65-89, 1970, 14 fig, 23 ref.

Descriptors: *Columbia River, *Thermal pollution, *Environmental effects, *Fish, River, Zooplankton, Aquatic life, Juvenile fish, Thermal powerplants, Temperature, Lethal limit, Migration, Distribution, Nitrogen.

To determine the effects of water temperature increases on aquatic organisms of the Columbia River, a floating laboratory was set up at Prescott, Oregon. Limnological data were collected at seven sampling stations from above the mouth of the Willamette River to below Puget Island. The temperature, flow, pH, dissolved oxygen, phosphate, silicate, calcium, magnesium, sodium, chlorophyll A and zooplankton abundance were measured throughout the year. Peak abundance of salmon and trout was in May, around the peak of the out-migration of juvenile chinook. Some juvenile salmon move slowly or remain in the lower river over long periods. Peak abundance of more than half the other species was in the May-July period. (Eagle-Vanderbilt) W73-04353

Thermal tolerance tests on four species of salmon and on steelhead trout showed that mortalities occurred at test temperatures which were similar to naturally occurring river water temperatures. An increase in water temperature in the river results in an increase in the percentage of nitrogen gas saturation. When the saturation was above 110%, temperature tolerances of the fish were lower and the fish were more susceptible to infections. Thermal tolerance tests were also run on zooplankton which serve as a food source for juvenile chinook salmon. (Eagle-Vanderbilt) W73-04331

BEFORE AND AFTER STUDIES ON THE EFFECTS OF A POWER PLANT INSTALLATION ON LAKE LBJ - A NUMERICAL TEMPERATURE MODEL FOR LAKE LBJ
Texas Univ., Austin, Center for Research in Water Resources.

For primary bibliographic entry see Field 05B.
W73-04335

BEFORE AND AFTER STUDIES OF THE EFFECTS OF A POWER PLANT INSTALLATION ON LAKE LBJ - MEASUREMENT AND PREDICTION OF ABNORMAL RESERVOIR OPERATIONS ON LAKE LBJ'S WATER QUALITY,
Texas Univ., Austin, Center for Research in Water Resources.
For primary bibliographic entry see Field 05B.
W73-04336

CONFERENCE ON BENEFICIAL USES OF THERMAL DISCHARGES.

For primary bibliographic entry see Field 05G.
W73-04337

TRENDS OF POWER GENERATION AND THERMAL DISCHARGES IN NEW YORK STATE
General Electric Co., Schenectady, New York.
For primary bibliographic entry see Field 05G.
W73-04338

INDEXED BIBLIOGRAPHY OF THERMAL EFFECTS LITERATURE - 2,
Oak Ridge National Lab., Tenn.
J. G. Morgan, and C. C. Coutant.
Available from the National Technical Information Service as ORNL-NSIC-97, \$10.00 in paper copy, \$0.95 in microfiche. Report ORNL-NSIC-97, May 1972, 278 p.

Descriptors: *Bibliographies, *Thermal pollution, *Electric power production, Analytical techniques, Beneficial use, Cooling towers, Ecology, Economics, Heat transfer, Materials, Meteorology, Regulation, Sites, Toxicity, Model studies.

This is the second volume in the series of indexed bibliographies of thermal effects literature published by the Nuclear Safety Information Center. It contains material that appeared in the literature during 1970 and 1971. The sources for this bibliography include technical journals, government sponsored reports, technical reports from universities, and conferences dealing with thermal discharges. The keyword index describes entries in the following groups: analytical techniques, beneficial use, cooling tower, ecology, economics, heat transfer analysis, intake, discharge, materials, meteorology, model, power generation methods, regulation, siting, toxicity, receiving waters. Emphasis on the effects of heat in aquatic ecosystems and environmental impact studies of nuclear power plant sites has increased. (Eagle-Vanderbilt) W73-04353

A NEW SPECIES OF PARASTENOCARIS (CRUSTACEA, COPEPODA) OF THE HYDROIC GROUND WATER OF THE LISCIA RIVER (SARDINIA), (IN ITALIAN),
Rome Univ. (Italy). Institute di Zoologia.

V. Cottarelli.
Riv Idrobiol, Vol 9, No 1/2, p 93-107, 1970, Illus, English summary.
Identifiers: Copepoda, Crustacea, Groundwater, *Hyporheic groundwater, Italy, Liscia River (Sardinia), *Parastenocaris, Parastenocaris-amathaea, Species, Water pollution effects.

A new interstitial species of harpacticoid crustacean is described: *Parastenocaris amathaea*, collected in the hyporheic ground water of the Liscia river (Sassari province, Sardinia, Italy.). The new species is characterized by the form and armament of P3, P5, and by the absence of endopodite P4 of female, and, also, by the armament of caudal branch of female and male. The species belongs to the cluensis group of Lang 1948, and is near *P. tyrrhenicus* Cottarelli 1970. Notes on the ecology and on the other interstitials crustacean of the Liscia river are also given.—Copyright 1972, Biological Abstracts, Inc.
W73-04378

TOXIC EFFECTS OF THE MYCOTOXINS AFLATOXIN B1, RUBRATOXIN B, PATULIN, AND DIACETOXYSCIRPENOL ON THE CRUSTACEAN CYCLOPS FUSCUS,
J. Reiss.

Journal of the Association of Official Analytical Chemists, Vol 55, No 4, p 895-896, July 1972, 9 ref.

Descriptors: *Invertebrates, *Toxicity, *Bioinsecticides, Aquatic animals, Aquatic life, Bioassay, Copepoda, Pollutant identification, Water pollution effects.

Identifiers: *Cyclops fuscus, *Mycotoxins, Aflatoxin B-1, Rubratoxin B, Patulin, Diacetoxyscirpenol, Sample preparation.

The crustacean, Cyclops fuscus, was used as a bioindicator for determining the toxic effects of the mycotoxins, aflatoxin B-1, rubratoxin B, patulin, and diacetoxyscirpenol on invertebrate animals. To determine these effects, samples of 20 to 30 C. fuscus were exposed to 100, 10, 1, and 0.1 micrograms per ml concentrations of each mycotoxin and mortalities were noted. Aflatoxin B-1 was most toxic, followed by diacetoxyscirpenol and rubratoxin B. Patulin showed toxicity only at the highest level (100 micrograms per ml). Duplicate tests did not differ more than 2 to 3 percent. (Long-Battelle) W73-04395

FACTORS OF ECOLOGIC SUCCESSION IN OLIGOTROPHIC FISH COMMUNITIES OF THE LAURENTIAN GREAT LAKES,
Bureau of Commercial Fisheries, Ann Arbor, Great Lakes Fishery Lab.

S. H. Smith.
Journal Fisheries Research Board of Canada, Vol 29, No 6, p 717-730, 1972, 2 fig, 38 ref.

Descriptors: *Biological communities, *Great Lakes, *Succession, *Environmental effects, *Water pollution effects, Productivity, Water quality, Fisheries, Eutrophication, Biomass, Lake Ontario, Lake Erie, Lake Huron, Lake Michigan, Lake Superior, Lampreys, Sculpins, Cisco, Salmonids, Perches, Yellow perch, Salmon, Lake trout, Atlantic salmon, Herrings, Pikes, Yellow perch, Smelts, Bass, Suckers, Catfish, Bullheads, Shiners, Reviews, Exploitation, Aquatic populations.

Identifiers: Alewife, Sea lampreys, Lake whitefish, Sturgeon, Blue pike, Sanger, Percids, Round whitefish, Pygmy whitefish, Blackfin, Chubs, Bloater, Burbot, Emerald shiners, Smallmouth bass.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Effects of Pollution—Group 5C

The effects of exploitation, drainage modifications, specific marine fish, and cultural eutrophication on the succession of fish communities in the Great Lakes are reviewed. The degree and sequence of response of families of fish and species within families differed for each factor, but the sequence of change among families and species has been the same in response to each factor as it affected various lakes at different times. The ultimate result of the disruption of fish communities has been a reduction of productivity of oligotrophic species that ranges from extreme in Lake Ontario to moderate in Lake Superior. Since oligotrophic species (primarily salmonines, coregonines, and deepwater cottids) are the only kinds of fish that fully occupied the entire volume of the deepwater Great Lakes (Ontario, Huron, Michigan, and Superior), the fish biomass of these lakes has been reduced as various species declined or disappeared. In Lake Erie, which is shallow, and in the shallow bays of the deep lakes, oligotrophic species were replaced by mesotrophic species, primarily percids, which have successively increased and declined. All oligotrophic species are greatly reduced or extinct in lakes Ontario and Erie, and are in various stages of decline in lakes, Huron, Michigan, and Superior, from greatest to least, respectively. (Mortland-Battelle)
W73-04399

YEARLY RESPIRATION RATE AND ESTIMATED ENERGY BUDGET FOR SAGITTA ELEGANS,
Bedford Inst., Dartmouth (Nova Scotia).
For primary bibliographic entry see Field 05B.
W73-04400

THE LIMNOLOGY AND FISHES OF OLIGOTROPHIC GLACIAL LAKES IN NORTH AMERICA (ABOUT 1800 A.D.),
Department of Lands and Forests, Thunder Bay (Ontario), Research Branch.
R. A. Ryer.
Journal Fisheries Research Board of Canada, Vol 29, No 6, p 617-628, 1972. 1 fig, 6 tab, 63 ref.

Descriptors: *Limnology, *Freshwater fish, Oligotrophy, Environmental effects, History, Geomorphology, Climatic data, Zooplankton, Aquatic animals, Eutrophication, Water pollution effects, Invertebrates, Fish populations, Aquatic populations.
Identifiers: *Glacial lakes, Morphometry, Prosopium, Esox, Semotilus, Notropis, Rhinichthys, Etheostoma, Percina, Cottus.

The general limnology and fish composition of 14 North American oligotrophic lakes are described as they likely were about the year 1800, prior to the adverse effects of man-made eutrophication, exploitation, and introductions of exotic species. The general description includes glacial history and geomorphology, climate and growing season, morphology of the lake basins, physical and chemical characteristics, macroinvertebrates, and zooplankton. Fish populations are described with respect to their zoogeographic origins and the species composition of each lake. The relative degree of environmental change brought about by the activities of man in each lake is summarized. (Long-Battelle)
W73-04401

THE EUTROPHICATION PROBLEM,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.
A. M. Beeton, and W. T. Edmondson.
Journal Fisheries Research Board of Canada, Vol 29, No 6, p 673-682, June 1972. 6 fig, 1 tab, 28 ref.

Descriptors: *Eutrophication, *Nutrients, Lake Michigan, *Nitrogen, *Diatoms, *Fish, Lake Erie, Oligotrophy, Sewage, Lake Huron, Lake Ontario, Saginaw Bay, Green Bay, *Plankton, *Water pol-

lution effects, Productivity, Phosphorus, Tropic level, Dissolved oxygen, Oxygen, Thermal stratification, Water pollution, Benthos, Salts, Distribution patterns.

Identifiers: Coscinodiscus radiatus, Diatoms, Oregonensis, Diatom tenuis var. elongatum, Fragilaria capucina, Stenopanopeus tenuis, Melosira binderiana, Melosira granulata, Asterionella formosa, Fragilaria crotontensis, Melosira ambigua, Diatoms minutus, Diatoms siroloides, Hexagenia, Mysis relicta, Coregonus artedii, Coregonus clupeaformis.

The trophic state of a lake is maintained by continued inputs of nutrients. In very large lakes the inshore environments are affected first by increased nutrient loading and, depending upon the morphology and morphometry, gradually the offshore waters are altered. The nearshore waters of Lake Michigan have greater concentrations of nitrogen and phosphorus and a lower silica content than open lake waters. Diatoms are more abundant inshore than offshore, the doubling times for diatom populations are shorter inshore, and species favored by nutrient-rich conditions are more abundant inshore. Data on plankton, nitrogen concentrations, and fish, from early studies on Lake Erie, show progressive changes from the shore lakeward and from the western basin eastward. (Byrd-Battelle)
W73-04403

ALGAL ASSAY PROCEDURE,
Uppsala Univ., (Sweden). Inst. of Physiological Botany.
For primary bibliographic entry see Field 05A.
W73-04404

LIMNOLOGY AND FISH ECOLOGY OF SOCKEYE SALMON NURSERY LAKES OF THE WORLD,
Bureau of Sport Fisheries and Wildlife, Sandusky, Ohio, Biological Station.
W. L. Hartman, and R. L. Burgner.
Journal of the Fisheries Research Board of Canada, Vol 29, No 6, p 699-715, June 1972. 1 fig, 2 tab, 76 ref.

Descriptors: *Sockeye salmon, *Limnology, *Eutrophication, *Nutrients, *Ecology, *Water pollution effects, Fish, Canada, Lakes, Spawning, Phosphates, Biomass, Growth rates, Zooplankton, Fish behavior, Migration patterns, Diel migration, Lake trout, Sculpins, Sticklebacks, Pike, Lampreys, Water pollution sources, Aquatic populations, Pink salmon, Chum salmon, Chinook salmon, Fish populations, Smelts.

Identifiers: Bioenergetic conservation, British Columbia, Kamchatka, Oncorhynchus nerka, Arctic char, Char, Cutthroat trout, Whitefish, Lake whitefish, Pygmy whitefish, Pond smelt, Babine Lake, Iliamna Lake, Dalne Lake, Lake Culiss, Lake Aleknagik, Lake Naknek, Lake Brooks, Lake Karuk, Lake Chignik.

Limnology and fish ecology are described of two lakes in British Columbia, five in Alaska, and one in Kamchatka. Following general topics are discussed: the biogenic eutrophication of nursery lakes from the nutrients released from salmon carcasses wherein during years of highest numbers of spawners, lake phosphate balances in Lakes Babine, Iliamna, and Dalne are significantly affected; the use of nursery lakes by young sockeye that reveals five patterns related to size and configuration of lake basins and the distribution of spawning areas; the interactions between various life history stages of sockeye salmon and such resident predators, competitors, and prey as Arctic char, lake trout, Dolly Varden, cutthroat trout, lake whitefish, pygmy whitefish, pond smelt, sticklebacks, and sculpins; the self-regulation of sockeye salmon abundance in these nursery lakes as controlled by density-dependent processes the interrelations between young sockeye salmon

biomass and growth rates, and zooplankton abundance in Babine Lake; and finally, the diel, vertical, pelagic migratory behavior of young sockeye in Babine Lake and the new hypothesis dealing with bioenergetic conservation. (Mortland-Battelle)
W73-04405

EFFECTS OF INTRODUCTIONS OF SALMONIDS INTO BARREN LAKES,
Institute of Freshwater Research, Drottningholm (Sweden).

N.-A. Nilsson.
Journal of the Fisheries Research Board of Canada, Vol 29, No 6, p 693-697, June 1972. 2 fig, 18 ref.

Descriptors: Lakes, Fish, *Food chains, *Predation, *Fish stocking, Invertebrates, Shrimp, Crustaceans, Plankton, Fish management, Lake trout, Brown trout, Zooplankton, Aquatic populations, Growth rates, Population, *Salmonids.

Identifiers: Polyartemia forcipata, Sweden, Char, Lake Michigan, Mysis relicta, Lake Pieskejaure, Arctic Char, Whitefish.

There are still many lakes in the Palearctic that are barren of fish because of deglaciation history. Early transplants of fish into such lakes have been documented, and there is a continuous activity of that kind going on for example in Scandinavia and at the North American west coast. Introductions of fish into barren lakes produce noticeable responses in the invertebrate fauna. For example, in a large mountain lake in northern Sweden the fairy shrimp Polyartemia forcipata disappeared after the introduction of Arctic char, and after a period of spectacular growth the fish now tend to get stunted. Changes in the invertebrate fauna after the introduction of new species of fish have been recorded also in many lakes with more complicated species compositions, and also in very large lakes such as Lake Michigan. In the Scandinavian mountain lakes there seems to be a correlation between the composition of fish species and the crustacean plankton. Further studies of introductions into barren lakes should provide a better understanding of predator-prey relations on the whole and, in the long run, of management of fish populations. (Mortland-Battelle)
W73-04406

LOCH LOMOND: MAN'S EFFECTS ON THE SALMONID COMMUNITY,
Nature Conservancy, Edinburgh (Scotland).

P. S. Maitland.
Journal Fisheries Research Board of Canada, Vol 29, No 6, p 849-860, 1972. 2 fig, 3 tab, 39 ref.

Descriptors: Biological communities, *Water pollution effects, *Salmonids, Freshwater fish, Limnology, Aquatic populations, Eutrophication, Exploitation, Fish stocking, Nutrients, Water quality, Trout, Salmon, Fishing, *Environmental effects, Water utilization, Fisheries, Brown trout, Sport fish, Recreation, Water supplies, Suspended solids, Hydrogen ion concentration, Dissolved oxygen, Chlorides, E. coli, Coliforms, Enteric bacteria, Biochemical oxygen demand, Commercial fishing.

Identifiers: *Loch Lomond, *Great Britain, Scotland, Salmo salar, Salmo trutta, Loch Ness, Loch Morar, Loch Tay, Loch Awe, Loch Maree, Loch Ericht, Loch Lochy, Loch Rannoch, Loch Shiel, Sea trout.

Loch Lomond, the largest area of fresh water in Great Britain, has been utilized by man for many hundreds of years. There are fifteen species of fish at present in the loch; all of these are native. Several of them have formed the basis of commercial and sport fisheries in the past but the only two species of importance at present (as sport fish) are salmon (*Salmo salar*) and trout (*Salmo trutta*). Man has influenced the loch in ways other than fishing:

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects of Pollution

several fish species have been introduced (none successfully); nutrient input is increasing; loch water is used for domestic and industrial supply; many forms of recreation take place on the loch; and it is of major importance as an amenity. In spite of these stresses there is no indication of any major change in the fish populations within recorded time; nor is there any evidence that they will alter the foreseeable future, providing a rational conservation program is developed for the area. (Long-Batelle)
W73-04407

COOLING WATER CHLORINATION AND PRODUCTIVITY OF ENTRAINED PHYTOPLANKTON,
Woods Hole Oceanographic Institution, Mass.
For primary bibliographic entry see Field 05F.
W73-04427

EUROPE'S MAJESTIC SEWER,
For primary bibliographic entry see Field 05G.
W73-04428

CARBONATE AND PHOSPHATE DETERGENT BUILDERS: THEIR IMPACT ON THE ENVIRONMENT,
Armour-Dial, Inc., Chicago, Ill.
E. Jungermann, and H. C. Silberman.
Journal of the American Oil Chemists' Society,
Vol 49, No 8, p 481-484, August 1972, 9 tab, 48 ref.

Descriptors: *Phosphates, *Detergents, *Waste water treatment, Sodium, *Sewage treatment, Alkalinity, Reviews, Carbonates.

The growing impact of phosphate and carbonate detergent builders on health and the environment was investigated through a review of the literature, calculations of carbon and sodium balance, wastewater treatment experiments, and aquatic toxicity studies. Experiments were conducted to ascertain the influence of alkalinity and carbonates on several treatment processes. Carbonate detergent builders were found to have no detrimental effects on sewage treatment. Also, there was no indication that carbonate detergents are more toxic to fish than phosphate detergents. (Murphy-Texas)
W73-04440

ASSAULT ON A LAKE,
J. McCull.
Environment, Vol 14, No 7, p 33-39, September, 1972, 3 fig, 17 ref.

Descriptors: *Lake Michigan, *Thermal pollution, Water pollution effects, Water treatment, Industrial wastes, Waste disposal, DDT, Dieldrin, Waste dilution.

An infestation with large construction projects, a lack of public awareness and sympathy, a lack of precise knowledge, and plethora of outmoded, pragmatic, engineering techniques are cited as major contributors to Lake Michigan's pollution and slow recovery, even with organized governmental pressure. The biological concentration of various long-lived pollutants defied the traditional concept of dilution, upon which much waste control engineering exists. The presence of thermal pollution effects was not recognized by many until recently. Many expedient solutions applied before 1900 are still in use. Too often, biological investigation was instituted only after the damage was done. This indicates that a thorough re-evaluation of pollution control is needed before a comprehensive science can be developed. (Anderson-Texas)
W73-04442

A METHOD FOR MINIMIZING EFFECTS OF WASTE HEAT DISCHARGES,
Baltimore Gas and Electric Co., Md.

For primary bibliographic entry see Field 05G.
W73-04481

NITROGEN AND PHOSPHORUS DYNAMICS IN THREE CENTRAL TEXAS IMPOUNDMENTS,
Southwest Texas State Univ., San Marcos. Dept. of Biology.

H. H. Hannan, W. C. Young, and J. J. Mayhew.
Hydrobiologia, Vol 40, No 1, p 121-129, 1972. 4 fig, 1 tab, 14 ref.

Descriptors: Water quality, *Impoundments, *Reservoir storage, *Texas, Inflow, Water sampling, Retention, Biota, *Phosphorus, *Nitrogen, Nutrients, Algae.

Identifiers: *Nutrient budget, *Nutrient traps, Lake Dunlap, Lake McQueeney, Lake Gonzales, Nitrate analysis, Autotrophic assimilation.

To further investigate the role of man-made impoundments in nutrient enrichment, nitrogen and phosphorus budgets were calculated for three central Texas reservoirs: Lake Dunlap, Lake McQueeney and Lake Gonzales. Monthly flow of nitrogen and phosphorus into each reservoir was estimated by the conversion of daily mean concentrations of total nitrogen and total phosphorus at stations upstream of each reservoir to weight basis for the total flow volume of water entering each impoundment per month. Water volumes used were estimated from monthly average discharges from reservoirs upstream. Each reservoir was sampled at four-hour intervals during February, May, August and November. During the other months, each station was sampled at mid-afternoon and between 2 A.M. and dawn. Annual nitrogen budgets show that all the lakes served as nutrient traps. For Lake Dunlap and Lake McQueeney the months with the highest positive nitrogen values coincided with the lowest discharge from the impoundment. Annual phosphorus budgets show that all three lakes lose phosphorus. Maximum retention of phosphorus occurred during the summer months. Based on nitrogen-phosphorus ratios, it is calculated that nitrogen is the nutrient factor which limits algal growth in all three lakes. (Goitschalk-Texas)
W73-04484

PHOSPHORESCENT VIBRIOS IN RESERVOIRS OF TURKMENIA, (IN RUSSIAN),
N. B. Mel'kumyan.
Izv Akad Nauk Turkmen SSR Ser Biol Nauk. 1, p 72-74, 1971. English summary.
Identifiers: Mouse experiments, *Reservoirs, Sheep corpuscles, *Turkmenia, USSR, *Vibrios, Luminescence.

Twenty strains of aqueous fluorescing vibrios were found in Turkmenian bodies of water. Morphologically the vibrios were gram negative bacilli, differing from normal type I vibrios only by their luminescence. Under laboratory conditions the vibrios lost their luminescence and their capacity for starch utilization and their hemolysis of sheep corpuscles. Some of the strains acquired the capacity to ferment glycerin and produce acetylmyethylcaproic acid. None of the strains caused death in white mice during oral administration. Copyright 1972, Biological Abstracts, Inc.
W73-04489

EFFLUENT STANDARDS AND THE ASSESSMENT OF THE EFFECTS OF POLLUTION ON RIVERS,
Water Pollution Research Lab., Stevenage (England).

For primary bibliographic entry see Field 05G.
W73-04494

EFFECT OF PETROLEUM AND PETROLEUM PRODUCTS ON STURGEON AND OTHER FISH, (IN RUSSIAN),
R. Y. Kasimov, and S. A. Rustamova.

Tr Tsentr Nauchno-Issled Inst Osetrovogo Khoz. 3 p 191-195, 1971.

Identifiers: Bream, Carp, Crab, Fish, Goby, *Petroleum products, Roach, *Sturgeon, *Toxicity, Zander, Water pollution effects.

The effect of different concentrations of petroleum on fish during different stages of development and in various conditions of salinity was studied. Sexual products, roe, embryos and larvae of sturgeon, sturgeons juveniles, zander, wild carp, bream, roach, goby and crab were studied. The survival rate, growth, nutrition and a series of reactions were considered. Petroleum from the deposit 'Petroleum Stones' was very toxic for fish. A dose of 0.03-0.05 mg/l in an aqueous solution was toxic for the majority of species. Juveniles of different species were killed by the introduction of 50-200 mg/l of the general amount of petroleum into the water or .05-.1 mg/l of petroleum in aqueous solution from the Shirvansk works. New demulsifiers which are being used were highly toxic for hydrological organisms and fish.—Copyright 1972, Biological Abstracts, Inc.
W73-04495

CONTROL OF GROWTH RATE BY INITIAL SUBSTRATE CONCENTRATION AT VALUES BELOW MAXIMUM RATE,
Oklahoma State Univ., Stillwater. School of Civil Engineering.

A. F. Gaudy, Jr., A. Obayashi, and E. T. Gaudy. Applied Microbiology, Vol 22, No 6, p 1041-1047, December 1971. 3 fig, 20 ref.

Descriptors: Bacteria, *Growth rates, Nutrients, E. coli, Water quality, Water pollution control.

Identifiers: *Hyperbolic relationships, *Substrate concentration.

The hyperbolic relationship between specific growth rate and substrate concentration was tested. Use of a *Flavobacterium* allowed direct measurement of growth rate and substrate concentration throughout the growth cycle in media containing a rate-limiting initial concentration of glucose. Specific growth rate versus initial concentration fit the hyperbolic equation, but the instantaneous relationship described by the equation was not observed. Well defined exponential growth curves developed at concentrations below that required for maximum growth. A constant doubling time was maintained until 50% of the initial substrate was used. Initial substrate concentration appears to set the growth rate by establishing a steady-state internal concentration of substrate. (Anderson-Texas)
W73-04499

HYDROBIOANTS' ADAPTATION TO A TOXIC FACTOR, (IN RUSSIAN),
Akademiya Nauk SSSR, Moscow. Institut Biologii Vnukovnykh Vod.

B. A. Flerov. Gidrobiol Zh. Vol 7, No 6, p 61-66, 1971. Illus. English summary.
Identifiers: Adaptation, *Hydrobiants, *Toxicity, Water pollution effects.

On the basis of original and literature data, some problems concerning hydrobiants adaptation to toxic substances are discussed. Some evidence is presented that the adaptation is possible by selection of more resistant individuals.—Copyright 1972, Biological Abstracts, Inc.
W73-04500

'SUN-SHADE' ADAPTATION IN MICROBENTHIC ALGAE FROM THE ORESUND,
Spildevandsudvalget, Soborg (Denmark). E. Gargas.

Ophelia, Vol 9, No 1, p 107-112, 1971. Illus.
Identifiers: *Algae, Benthic algae, Denmark, *Oresund, *Sun-shade adaptation, Sweden.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

Changes in the 'sun-shade' adaptation in microbenthic algae in the oresund were investigated. At 8 m water depth the algae of the sediment surface were 'shade'-adapted during most of the time. The maximum Ik-value reached was about 9 klux. At 0.3 m water depth a maximum Ik-value of about 21 klux was found. At both localities the lowest Ik reached was about 4 klux. There is no significant difference in Ik between the pseudobenthic algae (free-living algae) and the paammophytic algae (algae attached to the sand grains). Also the adaptation-change of algae buried at various depths in the sediment has been investigated. In Oct.-Nov., algae from 6.7 cm depth have an Ik similar to that of the surface algae, indicating occasional vertical mixing of the sediment.—Copyright 1972, Biological Abstracts, Inc.
W73-04519

CONCERNING CONSERVATION OF THE HOHE MARK FOREST MASSIF AND OF THE HIGH VALLEYS OF THE SCHWALM AND ITS TRIBUTARIES AT ELSENBORN,
Liege Univ. (Belgium). Dept. of Botany.
For primary bibliographic entry see Field 06G.
W73-04523

EFFECTS OF ELEVATED TEMPERATURE OF JUVENILE COHO SALMON AND BENTHIC INVERTEBRATES IN MODEL STREAM COMMUNITIES,
Oregon State Univ., Corvallis.

R.A. Iverson.

Available from Univ. Microfilms, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106. Order No. 72-9815. PhD Dissertation, 1972. 106 p.

Descriptors: *Salmon, *Streams, *Growth rates, *Invertebrates, *Model studies, Thermal pollution, Water pollution effects, Aquatic populations, Benthic fauna, Mayflies, Insects, Stoneflies, Aquatic insects, Bioassay, Water temperature, Population.

Identifiers: Coho salmon.

Juvenile coho salmon (*Oncorhynchus kisutch* (Walbaum)) and aquatic invertebrates were subjected to experimentally increased, but naturally fluctuating, temperatures in a model stream channel. Coho of the 1969, 1970, and 1971 year classes were reared in the heated model stream and in an unheated control stream, both located at the Oak Creek laboratory west of Corvallis, Oregon. The average increment of experimental over control temperature was 4.3 °C over the entire experimental period of 22 months. Temperatures in the control stream were generally favorable for growth of coho if food organisms were scarce, while temperatures in the heated stream were favorable for growth if food organisms were abundant. While population size was nearly the same in the two streams, coho in the control stream grew much more rapidly than in the heated stream. Total production of coho of the 1971 year class, which were reared from the egg stage, was approximately five times as great in the control as in the heated stream when the experiment was terminated in August 1971. The difference in production resulted from larger population size and higher growth rate in the control stream. Production of aquatic stages of insects was approximately twice as great in the control as in the heated stream over the period May 1970-May 1971. This difference between streams was especially marked in mayfly and stonefly nymphs, which were the most abundant insects in both streams, and which appeared to be the major sources of food for coho. The reduced growth rates of coho in the heated as compared to the control stream probably resulted from effects of temperature on the invertebrate food supply as well as from direct effects of temperature on the coho in raising their standard metabolic rates so that energy available for growth was reduced. (Snyder-Battelle)
W73-04545

**STREAM FAUNAL RECOVERY AFTER MAN-
GANANE STRIP MINE RECLAMATION,**
Virginia Polytechnic Inst. and State Univ., Blacksburg.

D.M. Hill.

Available from Univ. Microfilms, 300 N. Zeeb Rd., Ann Arbor, Mich. 48106. Order No. 72-16289. PhD Dissertation, 1972. 73 p.

Descriptors: *Toxicity, *Benthic fauna, *Reclamation, *Strip mines, *Manganese, Silts, Growth rates, Acid mine water, Turbidity, Limiting factors, Streams, Ions, Aquatic animals, Monitoring, Pollutant identification, Waste water (Pollution), Water pollution, Water pollution control, Bioassay, Acidic water, Mine water, Physical properties, Inorganic compounds, Sediments, Suspended solids, Bioindicators, Mine waste, Water pollution effects, Aquatic populations, Rainbow trout.

Identifiers: *Inorganic silt, *Recovery, Jackson turbidity units.

In order to measure the effectiveness of manganese strip mine reclamation relative to stream faunal recovery, periodic stream monitoring activities and acute and chronic toxicity studies were conducted from July, 1968 through September, 1970. The streams under study drained areas representing four degrees of reclamation; reclaimed, partially reclaimed, unreclaimed, and unaffected. Analysis of the physical, chemical, and biological parameters monitored indicates that the pollutant limiting to populations of fish and bottom organisms in the reclaimed and partially reclaimed streams is inorganic silt. 'Complete' reclamation of spoil areas measurably reduces levels of siltation and turbidity, thus permitting recovery of the previously stressed faunal communities. The acute toxicity studies indicated that ambient levels of suspended silt and manganese ions in the study streams are not high enough to be acutely limiting to resident fish species. However, chronic exposure of rainbow trout to about 700 Jackson Turbidity Units of suspended inorganic silt resulted in significantly lower growth rates than for fish reared under the same conditions in non-turbid water, suggesting adverse physiological effects of sublethal levels of silt in suspension. (Long-Battelle)
W73-04546

5D. Waste Treatment Processes

TRICKLE IRRIGATION....A MORE EFFICIENT MEANS OF WATER MANAGEMENT,
Texas A and M Univ., Weslaco. Agricultural Research and Extension Center.
For primary bibliographic entry see Field 03C.
W73-03953

STARTING WITH TRICKLE IRRIGATION,
Business Dynamics Corp., Phoenix, Ariz.
For primary bibliographic entry see Field 03C.
W73-03958

CONQUEST OF WASTES SHOW PRODUCTIVITY.
For primary bibliographic entry see Field 03F.
W73-03979

**WASTE WATER REUSE-A SUPPLEMENTAL
SUPPLY,**
Los Angeles County Sanitation District, Calif.
J.D. Parkhurst.
Journal of the Sanitary Engineering Division, American Society of Civil Engineers, Vol 96, No No 3, p 653-663, 1970. 1 fig, 5 tab.

Descriptors: *Reclaimed water, *Water deliveries, *Desalination, Activated sludge, Percolation, Groundwater, Tertiary treatment, Reverse osmosis, Ion exchange, Electrodialysis, *Water reuse, *California, Waste water treatment.

Identifiers: *Los Angeles, *Sanitation districts, *Water renovation plants, Sewerage systems, Storage facilities, Carbon adsorption.

Reuse of waste water after purification is becoming an acceptable reality in many water-short areas of the world. The lack of overall public acceptance for this renovation of effluent has been frustrating to proponents of this program. The huge metropolitan center of Los Angeles is situated extremely far from natural water sources and still continues to dump 800 million gallons/day of once used waste water into the Pacific Ocean. Although tests have established beyond reasonable doubt that reclaimed water need not contribute to public health risks, several water projects have been or are nearing completion. The California Water Project is scheduled to begin operation in 1971-73. Even though the Sacramento River contains substantial amounts of agricultural and domestic waste water, the quality here will be considerably better than that before attained from the Colorado River. A surplus of water is predicted which will allow for higher quality first-time and therefore better quality waste water for reuse. Developing technology and tertiary processes can be readily applied at the water renovation plants now under construction. Ultimately, demineralization of effluent may be practical on a large basis, since projects now under development are already competitive and offer promise of a greater economy in the future. Whereas only a portion of the waste water is suitable for treatment and reuse, it must be taken in its proper perspective—as a supplemental supply. (Gottschalk-Texas)
W73-03987

**RECLAMATION AND INDUSTRIAL REUSE OF
AMARILLO'S WASTE WATER,**
C.H. Scherer.

Journal, American Water Works Association, p 159-162, 1971. 3 fig, 1 tab.

Descriptors: *Effluents, *Activated sludge, Aeration, *Texas, *Water reuse, Waste water treatment, Water treatment, Treatment facilities, Cost analysis, Economics, Industrial wastes, Industrial water, *Reclaimed water.

Identifiers: *Amarillo (Tex), Digesters, Clarifiers.

The Water Reclamation and Sewage Treatment Plant of the City of Amarillo has been satisfactorily providing reclaimed water to Texas Co.'s Amarillo Refinery since 1955 and cooling water to Southwestern Public Service Co.'s Nichols generating station since 1960. A number of reasons, chiefly the growing cost of treating sewage, persuaded the City of Amarillo to attempt to cleanse and then reuse, industrially the effluent received at the treatment plant. The contract with industry stated these provisions: (1) the City of Amarillo would build a completely new sewage treatment plant; (2) the industrial customers would provide their own facilities to render the effluent usable for their services; (3) the City of Amarillo would provide to the industries effluent of a predetermined and set quality. Some of these provisions have been or are now in the rewriting process in order to further specify the quality of the effluent. During the time since 1955, much has been learned through mistakes as well as proper procedures. For instance, the quality of raw effluent received at the treatment plant dictates the cost of reused water. These first fifteen years have been profitable to the city as well as to industry. Some advantages are: (1) revenue from the effluent; (2) low cost industrial water; and (3) a valuable water source enlarged by each gallon of recycled water employed. (Gottschalk-Texas)
W73-03988

RESEARCHES ON REMOVAL OF COLLOIDAL MATTER FROM WASTE WATER PRODUCED

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

IN SANITARY PORCELAIN WARE AND CERAMIC INDUSTRY,
Institutul de Studii si Proiectari Hidroenergetice,
Bucharest (Romania).

M. Mihail.

Water Research, Vol 6, No 8, p 951-958, August 1972, 7 fig, 1 tab.

Descriptors: *Suspended solids, *Sedimentation, *Coagulation, *Alum, Industrial waste, *Waste water treatment, Settling velocity.

Identifiers: *Ceramics, *Stone-ware, Chemical treatment.

Waste waters from sanitary ware, ceramics, faience and stone-ware industries have a high content of minute mineral suspended solids. Natural sedimentation removed 70-90 percent of the solids from sanitary ware effluents, while 100-200 mg per liter of alum were required to treat the resulting solution. Natural sedimentation removed 70-80 percent of suspended solids from the effluents of the polyceramics industry, while chemical treatment with 200-400 mg per liter of alum was optimum for further treatment. For effluents from faience and stone-ware plates manufacture, natural sedimentation accounted for the removal of 75-98 percent of the suspended solids. Settlement was favored by gentle stirring. The optimum coagulant dosage to treat the remaining supernatant was in the range of 300-600 mg per liter of alum. (Murphy-Texas)

W73-03990

A COMPARATIVE STUDY OF THE INACTIVATION OF VIRUSES IN WATER BY CHLORINE,
Cincinnati Univ., Ohio. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 05F.
W73-03991

STUDIES ON PURIFICATION THEORIES AND MECHANISM OF ACTIVATED SLUDGE. (III) SIMILARITY IN ABSORPTION MECHANISM OF ACTIVATED SLUDGE AND CHARCOAL,
Osaka Municipal Public Work Bureau (Japan).

S. Hashimoto, and F. Masanori.

Hakko Kogaku Zasshi, (Journal of Fermentation Technology), Vol 48, No 5, p 263-269, 1970, 10 fig, 4 tab, 6 ref. (English abstract).

Descriptors: *Mathematical studies, *Activated sludge, *Charcoal, Sludge treatment, Adsorption, Suspended solids, *Waste water treatment, Waste treatment, Dyes, Silica.

Identifiers: *Michaelis-Menten equation, *Freundlich equation, Respiration reaction.

Modified Michaelis-Menten equation and Freundlich equation were applied to investigate the similarity in adsorption mechanism between activated sludge and charcoal. The adsorption reaction of silica fine particles for activated sludge was similar to that of dye for charcoal, from the viewpoint of effect of concentrations of activated sludge and charcoal on Km and n in the modified Michaelis-Menten equation and K1 and n in the Freundlich equation. The adsorption reaction of dye for charcoal combines both respiration reaction of activated sludge and adsorption reaction of inorganic suspended solids and BOD for activated sludge. Km and n in the modified Michaelis-Menten equation may be supposed by the K1 and the n in the Freundlich equation as evident from the investigation and analysis. (See also W73-03994) (Murphy-Texas)

W73-03993

STUDIES ON PURIFICATION THEORIES AND MECHANISM OF ACTIVATED SLUDGE. (IV) APPLICATION OF PURIFICATION THEORIES TO THE ACTIVATED SLUDGE PROCESS,
Osaka Municipal Public Work Bureau, (Japan).
S. Hashimoto, M. Fujita, and K. Matsushita.

Hakko Kogaku Zasshi, (Journal of Fermentation Technology), Vol 48, No 5, p 270-276, 1970, 15 fig, 2 tab, 9 ref. (English abstract).

Descriptors: *Activated sludge, *Sludge treatment, *Mathematical studies, Biochemical oxygen demand, Design criteria, Sewage treatment, *Waste water treatment, Waste treatment, Mixing. Identifiers: *Freundlich equation, *Katz equation, Purification.

The purification theories of activated sludge were applied to the activated sludge process on a practical plant scale and it was found out that the Freundlich equation and Katz equation fitted in the activated sludge process. Purification equations were compared and examined with the help of data obtained from the apparatus for the completely mixed-continuous system. The mechanism of BOD removal of activated sludge was shown to be expressed by either the Freundlich equation or the Katz equation. Application of both equations to the management and design of a sewage treatment plant is discussed. (See also W73-03993) (Murphy-Texas)
W73-03994

CONCENTRATION OF REOVIRUS AND ADENOVIRUS FROM SEWAGE AND EFFLUENTS BY PROTAMINE SULFATE (SALMINE) TREATMENT,
San Diego County Dept. of Public Health, Calif. B. England.

Applied Microbiology, Vol 24, No 3, p 510-512, September, 1972, 1 tab, 12 ref.

Descriptors: *Viruses, Sewage effluents, Separation techniques, Sampling, Waste water, *Analytical techniques, *Waste water treatment.

Identifiers: *Reovirus, *Adenovirus, *Enterovirus, *Salmine treatment.

A method was sought that would preferentially concentrate reovirus or adenovirus over enterovirus. Laboratory studies established that protamine sulfate (salmine) treatment may be used to concentrate adenoviruses and reoviruses, and its limited effectiveness for concentrating enteroviruses helps prevent overgrowth of reoviruses and adenoviruses by more rapidly replicating enteroviruses. It was also found that bovine albumin added to sewage or effluent samples before salmine treatment permitted viral recovery that otherwise did not occur. This procedure recovered 80 to 100 percent of reovirus or adenovirus exogenously added to sewage. For naturally occurring virus in field samples of sewage and primary or secondary effluents, the procedure effected concentrations of 50 to 400 fold. (Murphy-Texas)

W73-03995

POLLUTION CONTROL BRIEFS.

Food Engineering, Vol 43, p 61-64, August 1972, 2 fig.

Descriptors: *Propane, Tomatoes, *Waste water treatment, Industrial wastes, Air pollution, Solid wastes, Water reuse, Waste disposal, Treatment facilities, Biological treatment, Aeration, Activated sludge, Trickling filters, Effluents, Pollution control, Instrumentation, Water quality control, Biochemical oxygen demand, Food processing industry, Hydrogen ion concentration. Identifiers: *Candy plant wastes, *Seafood wastes, *Tomato industry, Catalytic mufflers, Beet sugar industry.

Items of interest were reported from several industries with tips, pointers, case histories and new developments for pollution control. A delivery company converted to propane carburetion for its truck fleet. Carbon monoxide and hydrocarbons were reduced in fork lift trucks with catalytic muf-

flers. The candy industry has developed a strategy to control their effluents. (Anderson-Texas)
W73-03998

ACID MINE DRAINAGE TREATMENT PROCESS TERMED SUCCESSFUL.

Mining Congress Journal, Vol 57, p 53, May 1971, 1 fig.

Descriptors: *Biological treatment, *Acid mine water, *Limestones, *Waste water treatment, Iron compounds, Cost comparisons, Oxidation, Settling basins, Pilot plants, Hydrogen ion concentration.

Identifiers: *Consolidation Coal Co., Precipitating agent.

A biological treatment system for acid mine waste treatment, developed by Consolidation Coal Company, uses ordinary limestone rather than the more expensive hydrated lime as a precipitating agent. The waste stream is pretreated with heat, air, nitrogen and phosphorus, the ferrous iron converted to ferric iron, and the pH altered for precipitation. Future studies include determining the effect of cold weather on bacteria performance. (Anderson-Texas)
W73-03999

REDUCES BOD 99%...AT LOW COST,

J. V. Ziembka.
Food Engineering, Vol 46, p 66-67, June 1971, 2 fig.

Descriptors: *Waste water treatment, *Septic tanks, *Settling basins, Biological treatment, Industrial wastes, Food processing industry, Chlorination, Biochemical oxygen demand, Cost analysis, Effluents, Suspended solids, Tertiary treatment, *Waste storage.

For small food processing industries, this package plant economically treats effluent in a three phase operation. The primary septic tank precipitates suspended solids. The secondary bio-treatment uses the new rotating disk aerator. Tertiary treatment is lagooning and optional chlorination. The advantages cited are 99% BOD removal, no clogging of media, low operating costs, rapid recovery from toxic material, and only one to two weeks for start-up. The system is still being tested to confirm its efficiency. (Anderson-Texas)
W73-04001

THE ROLE OF THE SPECIALIST WATER TREATMENT COMPANY,
For primary bibliographic entry see Field 05F.
W73-04002

COOLING WATER SCALE CONTROL: THE SCALE METER AND THE CRITICAL PH OF SCALING,
Questionics, Los Angeles, Calif.
H. Feiter.

Materials Protection and Performance, Vol 11, No 6, p 29-33, June 1972, 7 fig, 4 tab, 10 ref.

Descriptors: *Cooling water, *Scaling, *Corrosion control, *Hydrogen ion concentration, Water reuse, Saturation, Stability, Chromium, Phosphates, *Waste water treatment, *Thermal pollution.

Identifiers: *Scale meter, Chemical treatment.

Effective corrosion inhibitors in cooling water treatment systems include chromates and phosphates. The latest trend, however, is the use of dispersants and sequestrants which prevent scaling by interfering with the growth of scale crystals. This shift in treatment combined with the increased re-use of cooling water results in renewed interest in the conditions under which

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

scaling and corrosion occur. Scaling indexes for saturation, stability, and critical pH are discussed and their significance explained. The Scale Meter is a continuous analyzer which can be used as an automatic controller which causes the addition of scale inhibitor or acid when critical pH is exceeded. Results obtained by the Scale Meter are reported. (Murphy-Texas)
W73-04003

ADSORPTION PROCESS EASSES ACID RECOVERY.

Environmental Science and Technology, Vol 6, No 8, p 687, August, 1972, 1 fig.

Descriptors: *Chemical wastes, *Industrial wastes, *Waste water treatment, Acids, Neutralization, Ion exchange, Resins, Recycling, Adsorption, Fertilizers, Separation techniques, Cleaning, *Adsorption.
Identifiers: Recovery, Aluminum phosphates, Backwashing, *Phosphoric acid recovery.

Lancy Laboratories has developed a phosphoric acid recovery unit which is designed to clean up acid-bearing wastes from aluminum brightening and finishing operations. The unit recovers more than 75% of the acid used, and the recovered acid needs only concentration before reuse. The acidic aluminum phosphate fraction which cannot be reused can be neutralized to form a fertilizer or aluminum phosphate could be recovered for sale. The heart of the unit is a U-shaped column packed with ion exchange resin. However, the separation process is strictly adsorption and desorption, with the resin serving only as a contacting medium. The process runs in a continuous loop, and has the advantage that recovery is not complicated by introducing chemicals into the column to desorb the acid. Once adsorption capacity is reached, the resin is backflushed with water to elute the acid and aluminum phosphate fraction. (Murphy-Tex-as)
W73-04005

HANDLING AND DISPOSAL OF CHEMICAL WASTES.

Weston (Roy F.), Inc., West Chester, Pa.
J. H. Robertson.
Industrial Water Engineering, Vol 6, No 7, p 26, 30, July 1969, 2 fig.

Descriptors: *Industrial wastes, *Solid wastes, *Incineration, *Chemical wastes, Sludges, Sludge disposal, Reclamation, Landfills, Chemical industry, Waste treatment.
Identifiers: Sanitary landfills, Salvage, Waste handling, Waste recovery, Composting.

In order to handle and dispose of chemical wastes efficiently and practically, a complete and accurate definition of the waste quantities, characteristics, and mode and variability of occurrence must be made. This subject may be approached by considering the general classes of wastes and then determining the handling and disposal techniques most appropriate to each. Incineration seems to be the only safe and effective means of disposal, the ash being then disposed of through sanitary landfill. The question of salvage within the chemical industry exists almost entirely with in-plant or process modification and control because salvage at the incinerator is practically non-existent. (Gottschalk-Texas)
W73-04008

ADJUSTABLE DRIVE UNITS SOLVE SEASONAL WASTE WATER TREATMENT PROBLEMS.

Water and Sewage Works, Vol 119, No 9, p 122-123, September, 1972, 3 fig.

Descriptors: *Sewage treatment, *Aeration, *Waste water treatment, Domestic wastes, Treatment facilities, Florida, Aeration lagoons, Seasonal.
Identifiers: Infi Drives, *Fort Walton Beach (Florida).

In order to meet the increasing sewage flow caused by the seasonal tourist influx the water pollution control plant for Fort Walton Beach, Florida, installed Barg-Warner adjustable drives on their mechanical aeration system. The drives, called Infi Drives, regulate the amount of aeration by varying the rpm's of the aeration system motor. This automatic control differs markedly from the adjustable drives and the V-belt, or constant speed drives systems which have been used for 30 years. (Gottschalk-Texas)
W73-04009

RECOVERS SALABLE PRODUCTS FROM WASTE YEAST,

Holstein und Kappert Maschinenfabrik Phönix G.m.b.H., Dortmund (West Germany). Process Engineering Div.

G. Wysocki.

Food Engineering, Vol 44, No 10, p 88-90, October, 1972, 4 fig, 2 tab.

Descriptors: *Industrial wastes, *Liquid wastes, *Separation techniques, Carbon dioxide, Distillation, *Waste water treatment, Water treatment, Biochemical oxygen demand, Heat exchangers, Evaporation, *Yeasts, Water reuse.
Identifiers: *Brewery effluents, *Waste yeast recovery.

A process is described for converting high-BOD liquid wastes from a brewery into yeast, ethyl alcohol, and high-purity water. In the process, the yeast bearing effluent is pumped from a collection vessel to a vibrating sieve where large particles are separated. The liquid is pumped into a plate heat exchanger where it is heated to 75°C to kill any vegetative yeast cells and inactivate their enzyme complex. In a tank fitted with a special stirrer, carbon dioxide and other volatile gasses are allowed to escape. The partially degassed liquid is then fed into a single or multiple effect plate evaporator where it is concentrated from 10-16 percent total solids to 30 percent under a vacuum. Roller dryers are used to achieve a water content of 8-10 percent. Further purification of the vapor distillate is carried out in a distillation column. (Murphy-Tex-as)
W73-04014

WASTE ACID TO BE RECOVERED AND REUSED.

Iron Age, Vol 210, No 5, p 31, August, 1972.

Descriptors: *Recycling, *Chemical wastes, Zinc, *Industrial wastes, Salts, Evaporation, Condensation, *Waste water treatment, *Metals.
Identifiers: *Sulphuric acid recovery, Metal treating plant, Soluble salts.

The New Jersey Zinc Company plans to evaluate a new process for the recovery and recycling of sulfuric acid from industrial wastes. It is expected that the process can be applied to sulfuric acid wastes from titanium dioxide pigment and metal treating plants. The method involves the evaporation of water and sulfuric acid, followed by controlled condensation. The acid stream produced will be recycled while the soluble salts will be collected dry and evaluated for possible applications. (Murphy-Texas)
W73-04015

COOLING WATER TREATMENT—WHERE DO WE STAND?

Betz Labs., Inc., Trevose, Pa.
J. M. Donohue.

Materials Protection and Performance, Vol 11, No 6, p 19-24, June 1972, 4 fig, 10 ref.

Descriptors: *Cooling water, *Corrosion control, *Scaling, Chromium, Organic compounds, Monitoring, Instrumentation, Automation, Waste water treatment.
Identifiers: *Chemical treatment.

The problems of corrosion, deposition, and biological fouling in cooling water treatment systems are considered. Recent methods for corrosion control using low chromate treatment and organic (nonchromate) treatment are described. Common fouling factors and the action of the dispersants used for deposition control are discussed. Monitoring methods and instrumentation are described along with the recent trend to automation of cooling system operations. (Murphy-Texas)
W73-04016

LEADING QUESTION,

L. D. Hills.
The Ecologist, Vol 2, No 8, p 22-24, August 1972, 1 tab.

Descriptors: *Lead, Industrial wastes, Sludge disposal, Sewage treatment, Land reclamation, Landfills, Environment, Soil treatment, Waste treatment.
Identifiers: *United Kingdom, *Beaumont Leys.

Before 1964, Leicester ran a sewage farm at Beaumont Leys which was started in the 1890's. In 1971, Leicester proposed to develop this land into housing for 40,000 people. Public concern arose regarding the possible buildup of toxic metals in the soil from deposits of industrial sludge. In particular, soil samples showed from 120 to 1197 parts per million of lead in the area, when the normal for British soil is under 100. Evidence is presented to show that the case of Beaumont Leys was exceptional and that with proper treatment the use of sewage would present no health hazard. The major source of lead pollution in the environment was noted to be the result of industry and the automobile. (Murphy-Texas)
W73-04017

PROTECTIVE MEASURES FOR COOLING SYSTEMS IN KEEPING WITH WATER QUALITY STANDARDS,

Betz Labs., Inc., Trevose, Pa.

D. A. Carter, and J. M. Donohue.

Materials Protection and Performance, Vol 11, No 6, p 35-38, June 1972, 2 fig, 4 tab, 5 ref.

Descriptors: *Water quality control, Chromium, Zinc, Phosphates, Industrial wastes, *Scaling, *Corrosion control, *Cooling water, *Waste water treatment.
Identifiers: Polymeric compounds.

Control of corrosion and scaling in cooling water systems can now be accomplished without the use of chromate or zinc. One such treatment program is based on phosphates in combination with phosphonates and organics and has proved its performance in many industrial systems. Other programs, based on phosphonates without phosphates, can be used successfully in air-conditioning systems. More recent treatments with polymeric compounds may eventually eliminate phosphorus-containing treatments, thus satisfying rigid pollution abatement criteria. (Murphy-Texas)
W73-04018

COOLING TOWER PLUME RISE AND CONDENSATION,

National Oceanic and Atmospheric Administration, Oak Ridge, Tenn. Air Resources Atmospheric Turbulence and Diffusion Lab.

S. R. Hanna.

Paper Presented at Air Pollution Turbulence and Diffusion Symposium, Las Cruces, New Mexico, December 7-10, 1971. 6 p, 1 fig, 10 ref.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

Descriptors: *Cooling towers, *Thermal powerplants, *Mathematical models, Diffusion, Mixing, Dispersion, Heat, Temperature, Water vapor, *Thermal pollution, Air pollution, Wind, Meteorological data, *Condensation, Cooling, Powerplants, Stability.
Identifiers: *Plume dispersion, *Dispersion equation, Gaussian dispersion equation, Air stability.

Recent regulations discourage the use of river or lake water for direct cooling in industrial processes. The trend is toward the increased use of evaporative cooling towers. In order to estimate the effects on the environment of heat and moisture discharges from proposed cooling towers, it is necessary to develop theoretical or empirical models of physical processes involved and verify them with observations. It is clear from the few environmental impact statements that have been seen that there currently are no standard methods for estimating plume rise and cloud formation from cooling towers. Furthermore, observations of cooling tower plumes are very limited. Methods of estimating cooling tower plume rise and the possibility of condensation are outlined. If it is assumed that water vapor diffuses in the same manner as an inert gas then the Gaussian dispersion equation may possibly be used, knowing the approximate wind speed and stability class. The techniques described provide a starting point for the analysis of the environmental impact of cooling towers. (Oleszkiewicz-Vanderbilt)
W73-04025

POWER PLANT COOLING SYSTEMS, Florida Power and Light Co., Miami.

G. Kinsman.
Journal of the Power Division, American Society of Civil Engineers, Vol 98, No P02. Paper 9231, p 247-252, October 1972, 1 tab.

Descriptors: *Cooling, *Heat, *Thermal powerplants, *Powerplants, Nuclear powerplants, Estuaries, Lakes, Reservoirs, Surface waters, Utilities, Water pollution, Waste disposal, Air pollution, Temperature, Water quality standards, Legislation, Environmental effects, *Thermal pollution.
Identifiers: *Waste heat, *Cooling systems, Conveyor flights.

Types of systems for the dissipation of heat, along with data required from other than engineering sources to insure compliance with environmental regulations covering both nuclear and fossil-fueled plants are presented. Large quantities of heat for steam condensation must be dissipated to the atmosphere requiring considerable quantities of water. The volume of water available, its temperature and quality, meteorological conditions, economics and environmental consequences must be considered in selection of a cooling system. Once-through and closed system wet and dry cooling towers, forced and natural draft types using fresh or salt water are available. Environmental regulations require input from many nonengineering disciplines. (Oleszkiewicz-Vanderbilt)
W73-04029

CIRCULATING WATER SYSTEMS WITHOUT VALVES, Gilbert Associates, Inc., Reading, Pa.

R. J. Wahani.
Journal of the Power Division, American Society of Civil Engineers, Vol 98, No P02. Paper 9264, p 187-199, October 1972, 8 fig, 4 ref.

Descriptors: *Water hammer, *Cooling, *Pumps, *Powerplants, Systems analysis, Cooling water, Circulation, Hydraulic transients, Water pollution, Thermal powerplants, Intakes.
Identifiers: *Thermoelectric power generation, Systems management, Cooling systems, Pump intakes, Dissolved gases.

The performance and operational problems of a circulating water cooling system for a large nuclear thermo-generating plant, where one pump serves a conduit and a surface condenser are analyzed. The analysis covers: (1) the effect that the dissolved air of the intake water has on the time required to prime the system; (2) hydraulic transients that occur in a primed system after starting a circulating water pump with falling power characteristics; (3) influence of vacuum breaker operation on the hydraulic transients occurring in the system after pump tripout; and (4) additional equipment needed for successful operation of the system. (Oleszkiewicz-Vanderbilt)
W73-04035

RECLAIMING COOLING TOWER BLOWDOWN, Resources Conservation Co., El Paso, Tex.

T. M. Fosberg.
Industrial Water Engineering, p 35-37, June/July 1972, 2 fig.

Descriptors: *Cooling towers, *Heated water, *Heat transfer, *Water reuse, Scaling, Brines, *Texas, Cooling, Wells, Hardness (Water), Evaporation, *Thermal pollution.
Identifiers: *Blowdown, Natural gas compression station, Makeup water.

Blowdown from cooling towers at El Paso Natural Gas Company's compressor station amounts to 50,000 gpd. A new brine concentrator returns more than 95 percent of this blowdown to the tower for reuse. The pure water recycled to the tower dilutes the mineral content of the well-water used for makeup, reducing blowdown by 20% and reducing makeup requirements by 25%. By-product salts can be recovered from the concentrated waste brine before disposal. Basic components of the evaporator are heat-transfer leaves, a steam compressor, an evaporator body, and a brine recirculating pump. At the El Paso plant, blowdown from the cooling tower is pumped to a feed tank that is maintained at a constant level. Evaporator feedwater is pumped through a heat exchanger into a deaerator, where desorbed atmospheric gases are removed. The feed then mixes with concentrated brine and is circulated to the top of the heat transfer leaves where it falls as a film over the leaves, producing steam and concentrated brine. The steam is condensed yielding 29.5 gpm of product water in the first stage. The efficiency is equivalent to that from a 27-effect evaporator. (Eagle-Vanderbilt)
W73-04040

ION EXCHANGE RESIN FOR REMOVAL OF HEAVY METAL IONS IN WASTE WATER, Aktiebolaget Billingsfors Bruk (Sweden).

K. Fuxelius.
Presented at International Congress on Industrial Waste Water, Stockholm, Sweden, Butterworth, London, November 1970, 9 p, 2 fig, 1 tab.

Descriptors: *Heavy metals, *Ion exchange, *Waste water treatment, Inorganic compounds, Chemical wastes, Resins, Water purification, Water pollution.
Identifiers: Mercury pollution.

The most acute problem among heavy metals is that caused by mercury. The mercury usually occurs in very low concentrations. The methods for removing it are: special chemical treatments, such as precipitation and sedimentation; adsorption; reverse osmosis; and ion-exchange. A special ion-exchange resin Q13 has been developed which has the property of binding the mercury in the presence of sodium chloride (in concentrations normally present in waste water). The resin, when saturated by mercury, can be regenerated with acidified brine. In a pilot plant which had been operating for 1 1/2 years, after the first ion-exchanger the mercury concentration dropped

from 1-5 ppm to 0.1-0.5 ppm. After the second ion-exchanger the value was 0.1-0.2 ppm. The absorption filter can decrease the contents to about 0.01-0.02 ppm. The mercury can be recovered. (Novotny-Vanderbilt)
W73-04047

DATA RECORD FOR PUBLIC ATTITUDES TOWARD REUSE OF RECLAIMED WATER, California Univ., Los Angeles. Water Resources Center.

For primary bibliographic entry see Field 06B.
W73-04059

BIOCONCENTRATION OF ARSENIC BY ACTIVATED SLUDGE BIOMASS, Washington State Univ., Pullman. Dept. of Civil Engineering.

W. F. Johnson, and E. Hindin.
Water and Sewage Works, p 95-97, October 1972, 3 fig, 2 tab, 2 ref.

Descriptors: *Arsenic, *Activated sludge, Heavy metals, Toxicity, Water pollution, Trace elements, *Waste water treatment, Biomass, Biological treatment.
Identifiers: *Arsenic uptake, *Bioconcentration, Accumulation.

A small activated sludge system was tested for bioconcentration effects of arsenic which was fed as sodium dibasic arsenate at an initial concentration of 37.5 micrograms per liter. Arsenic was removed by activated sludge biota through assimilation and adsorption. As the total arsenic concentration increased in the influent so did the quantity of arsenic in the biomass. It has been shown graphically that the greater the biological activity (expressed as removal of COD) the greater the uptake of total arsenic. (Oleszkiewicz-Vanderbilt)
W73-04124

SEWAGE TREATMENT PLANT AND METHOD OF TREATING SEWAGE, J. L. Bergles, and M. A. Nelson. U.S. Patent No 3,681,236, 3 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 901, No 1, p 273, August 1, 1972.

Descriptors: *Patents, *Sewage treatment, Equipment, *Aerobic treatment, *Biological treatment, *Waste water treatment, Filters, *Filtration, *Trickling filters, Water quality control, Pollution abatement, Water pollution control.

The major portion of sludge is settled out in the first tank. The resulting fluid is transferred to a second tank where clarification occurs and a small amount of sludge is removed. Aerobic biological action takes place in the third tank into which the fluid is transferred. The fluid may be chlorinated before it is passed through a filter bed where a trickling filter action takes place. (Sinha-OEIS)
W73-04130

INTERNAL PRECIPITATION OF PHOSPHATE FROM ACTIVATED SLUDGE, Biospherics, Inc., Rockville, Md. (assignee).

G. J. Topol.
U.S. Patent No 3,681,235, 3 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 901, No 1, p 273, August 1, 1972.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, *Aeration, *Activated sludge, Biochemical oxygen demand, Microorganisms, *Phosphates, Aluminum, Iron, Alkalies (Bases), Water quality control, Water pollution control, Water pollution, Pollution abatement.
Identifiers: *Water pollution prevention.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

The sewage material is mixed with activated sludge and is then passed to an aeration zone to reduce its BOD. The microorganisms take up phosphate. The phosphate-enriched sludge is passed to a stripping zone and treated to cause the microorganisms in the sludge to release phosphate. A precipitant such as an aluminum or iron salt, or an alkali such as lime is added to precipitate the soluble phosphate content of the sludge. (Sinha-OEIS) W73-04131

METHOD OF WATER FILTRATION,
Johns-Manville Corp., New York (assignee).
D. R. MacPherson.
U.S. Patent No 3,680,699, 5 p, 1 fig, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 901, No 1, p 153, August 1, 1972.

Descriptors: *Patents, *Waste water treatment, *Water purification, Water treatment, *Filtration, Sands, *Diatomaceous earth, Water quality control.

A precoat layer containing less than 0.25 pounds of porous granular material per square foot is deposited on the top surface of a sand filter. The water to be clarified is passed through the precoat layer and then through the sand filter. It is preferred that the precoat layer consists of flux-calcined diatomaceous earth which will pass an 8 mesh screen and will be retained on a 100 mesh screen. (Sinha-OEIS) W73-04132

BATCH SEWAGE TREATMENT SYSTEM,
Pollution Control Products, Inc., Portland, Maine (assignee).
J. Koulovatos, and K. L. Thomas.
U.S. Patent No 3,679,053, 5 p, 7 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 900, No 4, p 1371, July 25, 1972.

Descriptors: *Patents, *Sewage treatment, Equipment, Treatment, *Oxygenation, *Aeration, *Waste water treatment, *Aerobic treatment, Abatement, Pollution abatement, Water quality control, Water pollution control.

Identifiers: Settling tanks, *Water pollution prevention.

The system consists of three tanks: the first is designed to receive raw sewage mixed with water and has an air comminutor which reduces the size of the sewage while exposing it to oxygen; the second tank serves as an aeration and settling tank; the third tank receives the pure liquid. An air lift within the first tank transfers the slurry to the second tank. The level of sewage in the second tank is maintained between high and low limits. The high limit is determined by a weir disposed between the first and second tanks. (Sinha-OEIS) W73-04136

FLUID POLLUTION ERADICATOR SYSTEM INCLUDING AN AIR BUBBLE SCRUBBING UNIT,
E. A. Hale.

U.S. Patent No 3,678,657, 3 p, 4 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 900, No 4, p 1271, July 25, 1972.

Descriptors: *Patents, *Air pollution, Equipment, Oil wastes, Dust, *Industrial wastes, Solid wastes, Neutralization, Water quality control, Water pollution control, Condensation, *Baffles, *Waste water treatment.

Identifiers: *Deodorization.

The system includes a cooling condenser unit for removing vapor, a baffle plate unit for removing solid impurities, and a fluid scrubbing and neutralizing unit. The baffle plates have air foils which are coated with a sticky substance for

removing the impurities from the fluid while in a state of turbulence. There are provided a series of bubbling tanks for scrubbing, neutralizing and deodorizing the polluted fluid. (Sinha-OEIS) W73-04137

LIQUID TREATMENT METHOD,

A. G. Basileans.

U.S. Patent No 3,677,936, 3 p, 6 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 900, No 3, p 1077, July 18, 1972.

Descriptors: *Patents, *Biological treatment, *Waste water treatment, Oxygen, *Oxygenation, *Bacteria, Pollution abatement, Equipment, Water quality control, Water pollution control, Water pollution treatment.

Identifiers: *Water pollution prevention.

Waste water is treated with a gas (oxygen) by use of a cylindrical hose made of resilient material having perforations through which the gas passes into the water. The gas (oxygen) promotes the bacteriological activity by oxygenation of the bacteria. (Sinha-OEIS) W73-04138

TREATMENT OF SEWAGE,

Atomic Energy Commission, Washington, D.C. (assignee).

H. R. Spragg.

U.S. Patent No 3,677,935, 4 p, 5 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 900, No 3, p 1077, July 18, 1972.

Descriptors: *Patents, *Sewage treatment, *Irradiation, *Detergents, *Sedimentation, *Radioisotopes, Pollution abatement, Water quality, Water quality control, Water pollution control, *Waste water treatment.

Identifiers: *Water pollution prevention.

Sewage is irradiated with 10,000 to 10,000,000 rad of ionizing radiation from X-ray or gamma ray sources to increase the sedimentation rate and the degradation of the organic constituents, and synthetic detergents. Radioactive isotopes may be selected from the class consisting of cobalt 60, cesium 137, strontium 90, thallium 204, promethium 147, europium 152, crypton 85, and the uranium series. (Sinha-OEIS) W73-04139

COMBINED STEAM POWER PLANT AND WATER DISTILLATION SYSTEM,
General Electric Co., Schenectady, N.Y. (assignee).

For primary bibliographic entry see Field 03A.

W73-04140

SEWAGE TREATMENT SYSTEM,

C. W. Ferm, and F. R. Sechler.

U.S. Patent No 3,677,409, 4 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 900, No 3, p 958, July 18, 1972.

Descriptors: *Patents, *Sewage treatment, Settling, *Aeration, *Filters, *Filtration, Equipment, Pollution abatement, Water quality control, Water pollution control, Water pollution treatment, *Waste water treatment.

Identifiers: Settling tanks, *Water pollution prevention.

A bulbous shaped fiberglass tank having a flat bottom is divided into an aeration compartment and a settling compartment. Overflow from the aeration compartment moves across the upper edge of the divider. A sludge removing conduit extending from the bottom of the aeration compartment over the divider plate has an air nozzle for creating a pumping action from the bottom of the settling compartment. An open topped skimmer bowl

removes foam and floating material from the settling compartment and transfers it to the aeration compartment. A removable filter screen is located upstream of the outlet from the tank. It is backwashed to prevent clogging. (Sinha-OEIS) W73-04141

METHOD AND APPARATUS FOR REMOVING SLUDGE FROM LIQUID,
National Dust Collector Corp., Skokie, Ill. (assignee).

R. L. McIlvaine.

U.S. Patent No 3,677,407, 4 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 900, No 3, p 957, July 18, 1972.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Sludges, Equipment, Metals, Pollution abatement, Water quality control, Water pollution control.

Identifiers: Settling tanks, *Water pollution prevention.

The settling tank has a special settling surface and a collection pit at one end. A collection bucket in the pit receives the sludge. The bucket is raised up out of the tank to discharge the sludge. It is discharged at a time when the sludge level is below the upper edges of the bucket and no washing action occurs to redistribute the material. (Sinha-OEIS) W73-04142

LIQUID AND SLUDGE TREATMENT,
Pennwalt Corp., Philadelphia, Pa. (assignee).

F. W. Keith, Jr.

U.S. Patent No 3,677,405, 5 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 900, No 3, p 957, July 18, 1972.

Descriptors: *Patents, Additives, *Liquid wastes, *Sludge treatment, *Centrifugation, *Waste water treatment, Solid wastes, Pollution abatement, *Freezing, Lime, Carbon, Chlorine, Ammonia, Water quality control, Water pollution control, Landfills.

Identifiers: *Water pollution prevention, Ferric sulfate, Sodium hydroxide, Aluminum sulfate, Soda ash.

The steps of this treatment consist of mixing chemical additives to raw water, sedimenting material from the mixture, filtering the separated water prior to distribution and subjecting the soft sludge to centrifugation. The soft sludge obtained from the centrifugation is fed through a freezing zone to completely freeze it. It is then passed through a thawing zone. The solids become more densely coagulated and are subjected to a second centrifugation for final deliquifying to obtain concentrated solids suitable for use as land fill and further cleaned water. The additives are selected from the group consisting of potassium permanganate, aluminum sulfate, ferric sulfate, lime, carbon, chlorine, ammonia, sodium hydroxide, and soda ash. (Sinha-OEIS) W73-04143

TERTIARY FILTERING ARRANGEMENT,
Environmental Sciences, Inc., Berkeley Heights, N.J. (assignee).

S. Boorjui.

U.S. Patent No 3,677,413, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 900, No 3, p 959, July 18, 1972.

Descriptors: *Patents, *Domestic wastes, *Municipal wastes, *Sewage treatment, Tertiary treatment, Pollution abatement, *Waste water treatment, Water quality control, Water pollution control.

Identifiers: Newsprint, *Water pollution prevention.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

Processed waste newsprint is added to water to be purified. It reduces the BOD content of the water being treated. The newsprint is ground until it can pass through a 70-80 mesh screen, cleaned with a solvent to remove oil, scorched and reground to a fineness that will pass a 400-mesh screen. The processed newsprint is added at the rate of approximately 100 to 200 pounds to one million gallons of sewage. It was found that 95% of the BOD can be removed at a rate sufficient for efficient sewage disposal into rivers or streams. (Sinha-OEIS)
W73-04144

WASTEWATER TREATMENT SEQUENCE,
Envirotech Corp., Palo Alto, Calif. (assignee).
M. M. Zuckerman, and A. H. Molof.
U. S. Patent No 3,676,334, 4 p, 14 ref; Official Gazette of the United States Patent Office, Vol 900, No 2, p 676, July 11, 1972.

Descriptors: *Patents, *Waste water treatment, *Hydrolysis, *Organic wastes, Organic matter, *Biological treatment, *Filtration, *Disinfection, Treatment, Water quality control, Water pollution control, Pollution abatement.
Identifiers: *Water pollution prevention.

Raw wastewater is subjected to hydrolyzing conditions to cause the soluble high molecular weight organic matter to be reduced in size to yield waste water containing low molecular weight soluble organic matter such as amino acids and mono and disaccharides. The next step consists of biological treatment to be followed by filtration and disinfection. (Sinha-OEIS)
W73-04146

PROCESS AND SYSTEM FOR CONTROL OF FLUIDS IN WATER DISPOSAL SURGE TANKS,
Mobil Oil Corp., Paulsboro, N.J. (assignee).
H. L. McKee.
U. S. Patent No 3,675,771, 3 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 900, No 2, p 549, July 11, 1972.

Descriptors: *Patents, Oil-water interface, Oily water, *Oil wastes, *Separation techniques, Equipment, *Oil pollution, *Waste water treatment, Pollution abatement, Water quality control, Water pollution control, Water pollution treatment.

The waste water is introduced into a surge tank where it separates into a lower water phase and an upper oil phase. As the water accumulates within the tank, it is withdrawn from the tank under conditions such that the height of the interface between the oil and water phases varies within the tank. Oil is separately withdrawn at a location above the oil-water interface and at a rate such that the thickness of the oil phase remains constant as the height of the oil-water interface varies within the tank. (Sinha-OEIS)
W73-04148

TREATING LIQUID WASTE EFFLUENT, R. L. Blair.

U. S. Patent No 3,674,216, 3 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 900, No 1, p 164, July 4, 1972.

Descriptors: *Patents, *Liquid wastes, *Waste water treatment, *Bactericides, *Biochemical oxygen demand, *Biological treatment, *Organic wastes, *Aeration, Chlorine, Ozone, Equipment, Water quality control, Water pollution control, Pollution abatement.
Identifiers: *Water pollution prevention.

Liquid waste is treated with a bactericide and is then aerated to reduce the BOD level. The shearing action of a wire brush wheel turning at high speed is used to break up minute particles of or-

ganic material present in the liquid before it is sterilized. The bactericide may be ozone, chlorine or a chlorine-supplying agent. (Sinha-OEIS)
W73-04150

BACKFLUSHING FILTER, United States Philips Corp.

W. Freeland.
U. S. Patent No 3,674,151, 4 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 900, No 1, p 147, July 4, 1972.

Descriptors: *Patents, *Waste water treatment, *Liquid wastes, *Filtration, *Filters, Equipment, Abatement, Pollution abatement, Water quality control, Water pollution control, Water pollution.
Identifiers: *Water pollution prevention, *Backwashing filters.

A liquid filtering apparatus comprises a container for receiving the waste liquid and a suction chamber having a liquid-permeable wall which forms a filtering element. Liquid is drawn from the container into the suction chamber through the filtering element. A backflushing nozzle is used to flush off the contaminants adhering to the filtering element. The filtering element is in the form of a circular screen and the backflushing nozzle extends radially of the screen and is rotatable about the central axis thereof. (Sinha-OEIS)
W73-04151

METHOD AND APPARATUS FOR CLARIFYING LIQUIDS,

Jadair, Inc., Port Washington, Wis. (assignee).
D. L. Schmutzler, and J. H. Schmutzler.
U. S. Patent No 3,674,145, 4 p, 4 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 900, No 1, p 146, July 4, 1972.

Descriptors: *Patents, Equipment, *Waste water treatment, *Settling velocity, Abatement, Pollution abatement, Water quality control, Water pollution control, Water pollution treatment, *Baffles, *Weirs, *Skimming.
Identifiers: *Water pollution prevention.

The water to be treated is delivered to the rear end of a tank which is divided longitudinally into two confining areas. It passes under a baffle which reduces turbulence, a second baffle reduces curl producing a 'calming' effect which allows the larger particles to settle out and be removed. The water is then passed over a crossover weir and the finer particles are settled out and removed. The cleanest water is skimmed out at an outlet baffle at the rear of the second stage. (Sinha-OEIS)
W73-04152

AES NEW ENGLAND COUNCIL SPONSORS FIRST WASTE TREATMENT CONFERENCE.

For primary bibliographic entry see Field 05G.
W73-04154

GKN'S NEW WATER AND WASTE TREATMENT DIVISION.

Water and Water Engineering, Vol 76, No 919, p 340, September 1972.

Descriptors: *Waste water treatment, Surveys, Design, Filtration, Sludge disposal, Water treatment, Instrumentation, Pumping plants, *Treatment facilities.

Identifiers: *Water recovery, Clarification systems, Chemical treatment.

The decision for G. K. N. Birwelco Ltd. to enter the field of water treatment and recovery follows a long study of the company's ability to fill the needs of the new field. The services offered include site survey and preliminary investigations, design clarification systems, filtration systems,

polishing and sludge handling systems, chemical handling and others. In addition, the company will let turnkey contracts for all treatment projects. (Anderson-Texas)
W73-04155

BULLETIN ON WASTE WATER CLEAN-UP PROCESS.

Canadian Mining Journal, Vol 93, No 10, p 85, October, 1972.

Descriptors: *Industrial wastes, *Waste water treatment, *Flotation, Carbon, Oils, Plastics, Steel, Land use, Cost comparison.
Identifiers: Air flotation, Refinery wastes.

A Denver Equipment Division publication entitled Flotation News discusses the advantages of dispersed air flotation over dissolved air flotation. Smaller size, less land area, and less time make this process attractive for removal or recovery of carbon black, latex, oils, plastics, and certain fibers. Dispersed air flotation is applicable to refinery wastes, tank car washings, steel mill wastes, insoluble oils from rolling mills and other similar waste streams. (Anderson-Texas)
W73-04156

SIMON-HARTLEY-CAROUSEL SEWAGE AND EFFLUENT TREATMENT.

Water and Water Engineering, Vol 76, No 919, p 339, September, 1972, 1 fig.

Descriptors: *Waste water treatment, *Aeration, Oxidation, Sewage, Industrial wastes, Sludge, Flow rates.
Identifiers: 'Carrousel', Brescia (Italy), Channel depth, Surface area.

'Carrousel', a patented system employing Simcar vertical-axis surface aerators for the treatment of sewage and industrial effluents, is marketed by Simon-Hartley Ltd. A 'Carrousel' plant consists of two process stages: (1) Carrousel aeration system of channels and (2) final settlement facility. Compared with other oxidation-ditch systems employing horizontal-shaft aerators, the 'Carrousel' shows high oxygen transfer per kWh; increase in rate of flow and channel depth; reduction in surface area requirement; and non-clog type of aerator avoids difficulties when treating heavy sludges. GEC-Elliott Process Automation Limited has completed manufacture, installation and commissioning of a combined gas, water, and electricity telemetry control and monitoring system for the municipality of Brescia, Italy. (Anderson-Texas)
W73-04158

PUTTING SEWAGE SOLIDS BACK TO WORK,

Metropolitan Sanitary District of Greater Chicago, III.
F. Kudrna.

Compost Science, Vol 13, No 1, p 12-14, January-February, 1972, 1 fig.

Descriptors: *Land reclamation, *Drainage, Sludge, Sewage disposal, Solid wastes, Economics, Soils, Liquid wastes, Fertilizers, *Illinois, Water reuse.

Identifiers: *Sewage solids, *Liquid fertilizer, Water monitoring, *Natural filtration, Waste water solids, Used water, *Chicago.

The Metropolitan Sanitary District of Greater Chicago has embarked upon an extensive program of research and testing to study the possibility and feasibility of land reclamation. The results show that solid materials removed from used water, once stabilized, can be used quite economically to rebuild soil and establish conservation and recreational open space. The liquid fertilizer is applied to the land and begins the combined process of

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

drainage and straining as it soaks in the soil. This natural filtering system insures that the water flowing into the stream is clean, free from silt and potentially a valuable resource. (Gottschalk-Texas)
W73-04159

RECONDITIONS BRINE TO CUT POLLUTION,
Western Regional Research Lab., Albany, Calif.
E. Lowe, and E. L. Durkee.
Food Engineering, Vol 43, p 50-51, August 1971, 1 fig, 1 tab, 3 ref.

Descriptors: *Brines, *Brine disposal, *Salts, Recycling, Carbon, Costs, Economics, Saline water, Organic wastes, Incineration, Food processing industry, *Waste water treatment, Water reuse.

Identifiers: Salt recovery, Saline water disposal.

Reconditioning brine by using the USDA's salt recovery and decontamination method can represent a saving factor. In this study a plant utilizing the USDA method has an initial cost of \$20,000 prorated over ten years. After the ten year period, a savings of approximately \$430 per year could be realized. The USDA method solved saline water disposal by using a submerged combustion evaporator, which involved less capital equipment costs, to crystallize salt. The organic contaminants were destroyed by incineration, then stored for the following year. Brine for the next season of operation is prepared by dissolving incinerated salt in water (3-5% solution). HC1 is added to recondition the brine. Carbon is filtered from the salt solution or allowed to settle out by gravity. (Anderson-Texas)
W73-04160

INLINE STRONG BLACK LIQUOR OXIDIZERS, A NON-CONVENTIONAL SECONDARY OXIDATION TREATMENT,
Western Kraft Corp., Hawesville, Ky.
R. C. Tobias, G. C. Robertson, D. E. Schwabauer, and B. Dickey.
American Paper Industry, Vol 53, No 10, p 36-38, October 1971, 3 fig.

Descriptors: *Sodium compounds, *Liquid wastes, Air circulation, *Odor, Injection, Cost analysis, Pollution abatement, *Waste water treatment.
Identifiers: *Black liquors, Compressed air, Air sparger systems.

In order to reduce the Na₂S content of black liquors and ease plant odor problems, an in-line oxidation device was developed which injects compressed air into the liquor line. A 90% reduction of Na₂S is claimed with few operational problems. The most serious drawback so far has been a need for additional bracing at the injection point. The air injector can be manufactured in any machine shop. Air sparger systems which were previously used cost about \$147,000 each. (Anderson-Texas)
W73-04161

REDUCES EFFLUENT FROM BLANCHING,
Western Regional Research Lab., Berkeley, Calif.
M. E. Lazar, D. B. Lund, and W. C. Dietrich.
Food Engineering, Vol 43, p 54, August 1971, 1 fig.

Descriptors: *Effluents, *Waste water disposal, *Food processing industry, Foods, Carrots, Pollution abatement, *Waste water treatment.
Identifiers: *Blanching process, Enzyme deactivation.

A short heating time and a holding period form the essence of a new steam blanching process which reduces effluent volume from steam and hot water blanching by 43%. When tested on carrots, enzyme deactivation and a mild cook occurred. The

final product was preferred by a taste panel over conventionally blanched carrots. (Anderson-Texas)
W73-04163

EFFECT OF POWDERED ACTIVATED CARBON ON COAGULATION WITH ALUM,
Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
R. D. Letterman.
Master's Thesis, (1971), 56 p, 14 fig, 4 tab, 28 ref.

Descriptors: *Activated carbon, *Turbidity, *Coagulation, Alkalinity, Bicarbonates, Hydrogen ion concentration, *Waste water treatment.

Identifiers: *Alum, Kaolin clay, Aluminum sulphate.

The effect of several variables (including concentrations of activated carbon, initial bicarbonate alkalinity, and pH) on the coagulation of powdered activated carbon suspensions, with aluminum sulphate was studied. Residual turbidities of coagulated carbon suspensions depend on the alum dose and initial carbon concentration; whereas, the optimum pH of coagulation was found to depend on the initial bicarbonate alkalinity. The alum dose required to decrease the total initial turbidity 90 percent in dilute kaolin clay was significantly reduced by the addition of carbon. Turbidity removal was significantly decreased by the addition of alum prior to the addition of carbon. (Smith-Texas)
W73-04165

INHIBITING WATER FORMED DEPOSITS WITH THRESHOLD COMPOSITIONS,
Calgon Corp., Pittsburgh, Pa. Water Management Div.

P. H. Ralston.
Materials Protection and Performance, Vol 11, No 6, p 39-44, June 1972, 3 fig, 1 tab, 7 ref.

Descriptors: *Scaling, *Corrosion, *Hydrogen ion concentration, Water reuse, Water treatment, Zinc, Chromium, Industrial wastes, Industrial water, *Waste water treatment.

Identifiers: Organic scale inhibitors, Inorganic scale inhibitors, Chemical treatment.

Four types of organic threshold inhibitors have been found useful in controlling water formed deposits. The three phosphate bearing compositions are classed as phosphonates, diphosphonates, and phosphate esters, while the fourth type, a polyacrylate, contains no phosphorus. The chemical structures of these inhibitors are discussed and compared with those of the inorganic polyphosphate inhibitors. The ability of both the inorganic and organic compositions to control scale deposits is discussed as well as the compatibility of these compositions with corrosion inhibitors and other water constituents. The relative ease of removal of the phosphorus bearing compositions is noted. (Murphy-Texas)
W73-04166

REVERSE OSMOSIS FOR WASTE WATER TREATMENT: WHAT, WHEN,
Aqua-Chem, Inc., Waukesha, Wis.
G. F. Leitner.

Tappi J Tech Assoc Pulp Pap Ind. Vol 55, No 2, p 258-261, 1972, Illus.

Identifiers: Membranes, *Reverse osmosis, *Waste water treatment, Electrodialysis.

Development work on membrane technology for concentration of waste water and recovery of by-products in the pulp and paper industry has been under way for the past 10 yr. Electrodialysis combined with transport depletion was developed and tested. Its future use will depend upon development of markets for the by-products produced. Ultra-filtration is also a membrane process in

which pressure is used to transport liquids through membranes. The process offers important prospects for commercial use if improved rejection can be achieved. Ultra-filtration offers the advantage of simplified equipment design. Reverse osmosis, a relatively new membrane process, was developed for use in concentration of dilute streams from pulp and paper mills—concentrations from 1 1/2-2 3/4% solids. Continuous runs of 6 mo. were carried out on production size modules. A self-powered flush system was developed to keep the membrane surfaces free of deposits.—Copyright 1972, Biological Abstracts, Inc.
W73-04187

STUDIES OF NITROGEN COMPOUNDS IN WATERS: I. SEPARATE OF NITRATE AND NITRITE NITROGEN IN WASTE WATERS (IN JAPANESE),

Gifu Coll. of Pharmacy (Japan).
K. Sasaki, Y. Ose, K. Nakanura, M. Tonomura, and Y. Sayata.

J Hyg Chem. Vol 17, No 4, p 260-264, 1971. Illus. English summary.

Identifiers: *Nitrates, *Nitrite nitrogen, Separation techniques, *Waste water treatment.

A two-step method was established for the separation of nitrate-nitrogen and nitrite-nitrogen in waste or polluted water. In the first step, organic N and ammonia-nitrogen, which are liable to be decomposed in the alkaline state, are removed by distillation, and the nitrate-nitrogen and nitrite-nitrogen are reduced by the Devarda alloy. In the second step, the same procedure is carried out after preliminary decomposition of the nitrite-nitrogen with sulfamic acid and the amount of nitrate-nitrogen is determined.—Copyright 1972, Biological Abstracts, Inc.
W73-04188

PREVENTIVE MAINTENANCE AND OPERATIONAL KNOW-HOW IMPROVE WASTE TREATMENT SYSTEMS,

Tunnel (K. W.), Co., Philadelphia, Pa.
R. R. Ruhiin.

Building Operating Management, Vol 19, No 10, p 84-87, October, 1972, 1 ref.

Descriptors: *Waste treatment, *Waste water treatment, *Treatment facilities, *Management, *Hydrogen ion concentration, Design criteria, Biological treatment, Oxygen, Flocculation, Sedimentation, Sludge treatment, Chemicals, Lime, Sodium compounds, Aeration, Nutrients.
Identifiers: Waste treatment plants, Waste disposal basins.

To maximize the effectiveness of both chemical addition and the physical treatment plant, plant management must know how to modify these two factors to solve waste problems. To obtain adequate breakdown of food by enzyme action it is necessary that bacteria multiply at a very high rate. They must have food in the form they can utilize, optimum oxygen, a proper environment (with adequate pH value of solution), and enough time to come in contact with the waste. Waste disposal basins can be prevented from becoming sour by properly maintaining pH level of the solution by corrective chemical additions such as lime, soda ash or caustic soda. At times it may be necessary to replenish the bacteria and/or supply the nutrients to help them grow rapidly. Chemicals are available to improve the flocculation, sedimentation, and conditioning of sludge. The plant engineer's staff must be knowledgeable, capable of operating according to design criteria, and develop preventive measures to insure safe, odorless operation. (Morparia-Texas)
W73-04178

NEW SENSORS FOR THE AUTOMATIC SORTING OF MUNICIPAL SOLID WASTE,
Massachusetts Inst. of Tech., Cambridge.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

S. D. Senturia, K. H. Lewis, D. G. Wilson, H. Hibberd, and F. Winkler.
Compost Science, Vol 12, No 5, p 6-11, September-October, 1971, 8 fig, 4 tab, 3 ref.

Descriptors: *Solid wastes, *Separation techniques, Selectivity, Spectroscopy, Pilot plants, Computers, Waste treatment, Waste disposal, Recycling, Reclamation, *Treatment facilities.

Identifiers: *Sensors, Accelerometer, Computer-controlled separation plant.

In the process of mixing rubbish with garbage for fewer total collections, or the use of home compactors to reduce the volume of trash, reusable or reclaimable components of the waste inevitably get contaminated by less desirable rubbish components. Mechanical separation of reclaimable components from the rest of the rubbish materials is worth considering. The development of two sensors programmed to code materials by pattern recognition is proposed. A sensor-computer-controlled separation plant is described. Efforts to develop multiple-output sensors also are described. A basic approach taken is that of exciting the object being tested in such a way that every object gives some kind of response, or signature. A library of such signatures could be used to classify the object which then could be separated. Two such signature methods based on infrared spectroscopy and on impact deceleration have been reported. The infrared sensor used reflectance spectroscopy; the impact sensor uses an accelerometer to produce a deceleration waveform. Each sensor used individually has successfully separated sample refuse materials into five or six categories. In combination, as is planned for a pilot plant, separation into many more categories is thought possible. (Morparia-Texas)
W73-04279

INDUSTRIAL WASTE CAN BE AN ASSET.

Water and Waste Treatment, Vol 12, p 17-18, May/June, 1968, 4 fig.

Descriptors: *Industrial wastes, *Waste water treatment, *Iron compounds, *Sludge disposal, Gypsum, Settling basins, Cost-benefit analysis, Separation techniques, Waste disposal, Pollution abatement.

Identifiers: *Waste pickle disposal process.

Waste pickle liquor from pickle vats at steel mills and fabricating plants contains up to 15 percent free sulphuric acid and up to 20 percent iron sulphate dissolved in water. This kind of waste has been dumped into abandoned mine shafts or deep wells, or even far at sea. Some metal industries have adopted the method of neutralizing the liquor with lime and settling the green sludge in lagoons. Both these approaches have been expensive. Du Pont has evolved a 'Waste Pickle Disposal Process', now available to industry. It gives the by-products: magnetic iron oxide, similar in composition to much of the ore now used in basic steel-making; and gypsum which is a principal ingredient of cement and wallboard. These products help offset the cost of the process. The basic process uses the principle of neutralization with lime but has the valuable features to separate the by-products into usable form. Even though small firms may not afford such a plant, a possibility of three to four firms sharing such a reactor and separation plant is not overruled. Marketability of the waste by-products would, in all likelihood, give a competitive edge to 'haulaway' firms with reactor and separation facilities. (Morparia-Texas)
W73-04280

REDUCTION OF CHROMATE BY ZINC AT CONSTANT PH'S. CHEMISTRY OF CHROMATE TREATMENT (PART 2) (IN JAPANESE), Tokyo Univ. (Japan), Faculty of Engineering. Y. Hisamatsu, and Y. Kitajima.

Journal of the Metal Finishing Society of Japan, Vol 19, No 11, p 26-30, 1969, 12 fig, 6 ref.

Descriptors: *Chromium, *Reduction (Chemical), *Hydrogen ion concentration, Oxidation, Chemical reactions, Zinc, Acids, Electrochemistry, Industrial wastes, *Waste water treatment.

Identifiers: *Reaction rates, Sulphuric acid, Chemical balance, Metal recovery.

An experimental study of the reduction of chromate by treating it with zinc dust was carried out at 25°C under the condition of maintaining pH at constant values by the addition of H₂SO₄. The change in composition of chromate solutions (0.5 to 2 g Cr (VI)/l) with time was examined at constant values of pH (i.e., 2.0, 2.5, and 3.0). It was shown that the reaction rate was determined by the process of surface reaction. When the concentration of Cr (VI) in the solution was higher, the reaction was slower. Linear relations were obtained between additional amounts of H₂SO₄ and amounts of Cr (VI) or zinc reacted. By the analysis of the above relations, it was found that the amount of H (+) introduced by the addition of H₂SO₄ was about 90% as large as that necessary for the reduction reaction. The balance of 10% was accounted for by the supply of H (+) mainly produced during the first step protolysis of Cr (III) aquo-ions. Electrochemical measurements on zinc panels in the chromate solutions were also made. On the basis of the electrochemical behavior of panels and reaction kinetics of zinc dust, there was provided a qualitative self-polarization diagram for the reduction reaction of chromate by treating with zinc. (Morparia-Texas)
W73-04282

NEW PROCESS MAY SOLVE UTILITY WASTE PROBLEM.

Electrical World, Vol 175, p 157-158, March 15, 1971, 1 fig.

Descriptors: *Waste treatment, *Waste water treatment, Industrial wastes, Landfills, Land reclamation, Organic wastes, Management, Sludges, Leachates, Sludge disposal, Waste disposal.

Identifiers: *Chemical fixation.

Environmental Sciences, Inc. (ESI) has developed a process called 'Chemical Fixation', which economically converts liquids and sludges into easily handled chemically and physically stable solids, without any effluents. It is claimed that the resulting inert solids may be useful in structural landfills and agriculture. ESI has also evolved methods to evaluate solids resulting from the 'Chemifix' process. Using these four methods the resulting solids have been claimed to measure up to the desirable standards. However, the process can not be indiscriminately used on all wastes. Some organic, toxic anions, and other non-toxic but desirable ions in the waste must be taken into account while designing the process. Pretreatment could be a must in some cases. This new process is now being offered for use through exclusive licenses, with complete installation and pre- and post-consulting services. Proper landfill planning and experienced management will also be provided, with the first commercial unit available by June 1971. (Morparia-Texas)
W73-04283

MINIMIZES FRUIT PEEL POLLUTION, Agricultural Research Service, Albany, Calif. Western Utilization Research and Development Div.
R. P. Graham, M. R. Hart, J. W. Ralls, W. A. Mercer, and H. I. Maagdenberg.
Food Engineering, Vol 43, p 52-53, August 1971, 1 fig, 3 tab.

Descriptors: *Industrial wastes, *Water consumption, Food processing industry, Waste treatment, Cost comparisons, Cost analysis, Cost-benefit ratio, Economic justification, Pollution abatement.

Identifiers: *Dry caustic peeling, Sodium hydroxide.

Dry caustic peeling of peaches, pears, and apricots reduces total pounds of BOD to one third of conventional methods and water consumption to about one fifteenth when applied at the one to two tons raw fruit per hour scale. The economic incentive lies in waste treatment efficiency rather than process improvement. Originally developed for the potato industry, the process consists of a sodium hydroxide solution applicator, drainage trough, and rapidly rotating rubber disks which scrub off the peel as the fruit passes them. The process variables studied were concentration, temperature, residence time, drain time, peeling disk type, spacing feed rate, slope and rotational speed. The next step is a scale-up to a ten ton per hour unit. (Anderson-Texas)
W73-04284

EXPERIENCES WITH THE SLUDGE PROGRAM IN THE DENVER AREA.

Denver Sewage Sludge Disposal District, Colo. W. Korbitz.
Compost Science, Vol 12, No 5, p 3-5, September-October 1971.

Descriptors: *Sludge digestion, *Sludge disposal, *Waste water treatment, Fertilizers, Sewage disposal, Soil stability, Soil conservation, Soil treatment, Land reclamation, Economics, *Colorado, *Water reuse.

Identifiers: *Sludge recycling, Barrow pits, *Denver, Soil application.

Due to complications, primarily expense and air pollution, in the procedures of waste treatment, the Metro Denver Sewage Disposal District, in 1969 began spreading a dewatered sludge on the Lowry Bombing Range where it was tilled into the soil. Although there have been successes concerning the fertilizer value of this dewatered waste, the true value will not be realized for the next year or so. Maximum surveillance for any type of health hazard is being provided along with a vital public information program. The Metro Denver District Staff is firmly convinced that future sewage sludge disposal must be accomplished by recycling the sludge to the land in order to both conserve the soil and provide a more economical and practical method of sludge disposal. (Gottschalk-Texas)
W73-04286

ELEMENTS OF SELECTION FOR SECONDARY WASTE TREATMENT SYSTEMS,

International Paper Co., New York. G. H. Rand.
Tappi, Vol 55, No 8, p 1192-1194, August 1972.

Descriptors: *Waste water treatment, *Biological treatment, Effluents, Aeration, Aerated lagoons, *Activated sludge, Filtration, Reliability, Operating costs, Industrial wastes, Water treatment, Waste water (Pollution), *Sewage treatment, Filters, *Treatment facilities.

Identifiers: *Trickling filters.

The major criteria used in rating biological processes should be reliability, capital requirements, and maintenance and operating costs. The following are the best waste treatment systems listed in order of reliability: (1) gravity flow lagoons, (2) primary clarifiers and mechanically aerated lagoons, (3) trickling filters, and (4) the activated sludge process. Due to the uncertainty of future requirements, separated sewers permitting additional treatment and space for further equipment should be included in the construction of treatment plants. (Gottschalk-Texas)
W73-04287

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

PROCESSES WASTES FOR PROFIT.

Food Engineering, Vol 43, p 56-57, December 1971, 2 fig.

Descriptors: *Waste water treatment, *Water reuse, *Recycling, Effluents, Diatomaceous earth, Chlorination, Water utilization, Cost analysis, Economics, Food processing industry, *Utah, *Waste disposal, Treatment facilities.

Identifiers: Washing basins, Processing plants, Turkeys.

Norbest Turkey Growers Association utilized the 'Dri-Flo System', a waste-handling system using stainless steel belts, to correct waste water effluents in their Utah primary processing plants. The 'no-trough' system saved 400 gpm of water. Overflow water from washing basins was recycled by filtering through diatomaceous earth and chlorination. Plant production of 800,000 lb. of oven-ready turkeys a day was doubled without doubling water usage. The 'K-System' employs a series of processing units for hydrolyzing solid wastes that are dried into animal meal. Economic evaluation of the system based on 150 days' operation with production equal to 100 days at design rate indicated an operating profit of \$140,110. Norbest will install a 'K-System' at the firm's plant at Pelican Rapids, Minnesota. Stearns-Rogers Corp. will be the installer. (Anderson-Texas)

W73-04289

EVALUATION OF TREATMENT PLANTS BY TRACER METHODS. ANNUAL REPORT, JAN. 1971-JAN. 1972, Georgia Inst. of Tech., Atlanta. Engineering Experiment Station.

For primary bibliographic entry see Field 05B.

W73-04297

RADIOACTIVE WASTES.

B. Koziorowski, and J. Kucharski.

In: Industrial Waste Disposal, Pergamon Press, Oxford, 1972, J. Bandrowski, translator and G. R. Nellist, editor, p 154-163, 5 fig, 2 tab, 18 ref. Trans. of Siedl Przemyslowe, Wydawnictwa Naukowo-Techniczne, Warsaw, 1972.

Descriptors: *Waste treatment, *Nuclear wastes, *Radioactivity, *Public health, Potable water, Absorption, Ion exchange, Evaporation, Anaerobic digestion, Sludge digestion, Waste disposal, Waste dilution, Ultimate disposal, Incineration, Underground, *Reviews, Coagulation.

The references listed in this review antedate to 1965. Treatment of highly active nuclear wastes by absorption on suitable minerals is less expensive than treatment by evaporation. Subsequently minerals are sintered to give a ceramic brick which is sunk in the sea or buried underground. Low-activity wastes may be concentrated by ion exchange or by coagulation. Radioactivity does not inhibit biological treatment processes unless the radioactivity exceeds 10 milliCuries/liter. Radioactive organic sludge may be digested anaerobically, de-watered, and burned. The magnitude of permissible concentrations for radioisotopes in surface waters, as compared with naturally occurring concentrations is shown. (Bopp-ORNL)

W73-04312

OZONE ACTIVE CARBON TREATMENT OF SEA WATER FOR SWIMMING POOLS, (IN GERMAN).

Kiel Univ. (West Germany). Hygiene-Institut.

G. Havemeister, and F. Jentsch.

Arch Hyg Bakteriol. Vol 154, No 5, p 447-461 1971. Illus. (English summary).

Identifiers: Bacteria, *Ozone active-carbon, Sea water, *Swimming pools, *Waste water treatment.

In a seawater-supplied orthopedic bath, the purification plant was modified by an ozone active-car-

bon stage for testing purposes. The fed-in North Sea water was loaded with increased amounts of organic substances, ammonia, nitrite, iron and manganese. Contamination was greatly eliminated by the treatment resulting in clear, odorless water. The redox potential required for germ destruction was maintained by use of a lower concentration of Cl than is necessary for conventionally purified water. The ozone range acts as an absolute barrier against bacteria. Since there is a high degree of probability that the ozone treatment will also inactivate viruses, this method seems to be particularly suitable for purifying waste-water collected near the shore to convert it into hygienic seawater for use in swimming pools. Copyright 1972, Biological Abstracts, Inc.

W73-04411

OPTIMIZING AN ACTIVATED CARBON WASTEWATER TREATMENT PLANT,

Kellogg (M. W.) Co., New York.

A. E. Cover, and C. D. Wood.

Industrial Water Engineering, Vol 7, No 4, p 21-23, April 1970. 1 tab.

Descriptors: *Waste water treatment, *Activated carbon, Velocity, *Operating costs, *Capital costs, Cost comparisons, *Optimization, *Treatment facilities.

Identifiers: Contactor time, Carbon capacity.

The economic importance of several design variables in a granular activated carbon water treatment plant is examined. The variables were plant size, contactor time, velocity, velocity in relation to contact time, regeneration loss, carbon capacity, absorbent cost, and number of contacting stages. The effect of each of these variables on operating and capital costs is discussed and the overall results are summarized in a table. (Murphy-Texas)

W73-04421

AUTOMATIC TREATMENT OF COOLING WATER,

Calgon Corp., Pittsburgh, Pa.

J. D. Crail.

Industrial Water Engineering, Vol 7, No 1, January 1970, p 19-21, 1 fig, 2 tab.

Descriptors: *Cooling waters, Automation, Chlorination, Water quality, Water quality control, Systems analysis, Hydrogen ion concentration, *Waste water treatment.

Identifiers: Chemical treatment, Positive automation control index, Debris.

In a typical cooling system debris usually settles out and accumulates in piping and equipment, seriously interfering with heat transfer and providing sites for accelerated corrosion or microbiological growth. Any combination of the accepted methods for dealing with these problems can be automated. A description of the benefits of such automatic control is presented, and the use of the Positive Automatic Control Index to select the proper component modules for building a packaged control system is illustrated. (Murphy-Texas)

W73-04422

WATER POLLUTION CONTROL IN PULP AND PAPER INDUSTRY,

Crown Zellerbach Corp., San Francisco, Calif.

H. R. Amberg.

Industrial Water Engineering, Vol 7, No 11, p 26-29, November 1970, 1 fig, 2 tab.

Descriptors: *Waste water treatment, *Industrial wastes, Pulp and paper industry, *Pulp wastes, *Tertiary treatment, Oxidation lagoons, Aerated lagoons, Activated sludge, Maintenance costs, Operating costs, Capital costs, Water pollution control.

Initial emphasis in the pulp and paper industry was on primary waste treatment to remove settleable solids. More recently, secondary treatment to remove soluble BOD has been the trend, and even more sophisticated tertiary treatment is presently under laboratory and pilot plant study. Secondary treatment using oxidation lagoons is advantageous because of ease of operation and low maintenance costs but requires large areas of land. To reduce land requirements aeration lagoons and activated sludge processes are employed. Some smaller mills pay municipal facilities to process their waste discharges. Tertiary treatment methods include artificial stream reactivation and color removal by lime precipitation or carbon absorption processes. Estimates of the involved capital and operating costs were given. (Murphy-Texas)

W73-04424

EFFLUENT STANDARDS AND WATER REUSE,

Essex River Authority (England).

H. Fish.

Water Pollution Control, Vol 68, Part 3, p 307-311, 1969, 2 tab, 3 ref.

Descriptors: *Water reuse, *Effluents, Reclamation, Biochemical oxygen demand, Color, Toxicity, Dilution, Sewage, Natural water course, Waste water treatment, Recycling, *Water quality standards.

Identifiers: Contact time, Carbon capacity.

Water reuse is significant when effluent derived flow is essential to water resources or when it inhibits the use of water resources. Water reuse can be protected by standards on the same basis as for any other stream use. The cost of implementing standards can be shared by the dischargers and the reusers. Another approach is that standards should be minimal for public hygiene with reusers funding their purification. Standards for reuse control must be more extensive than the usual BOD limitations, including dissolved salts, non-biodegradables, color, toxicity, and bacteriological salts. Keeping these parameters under control can be accomplished by dilution, additional effluent treatment, or additional water intake treatment. Although improved standards are inevitable, improved management of natural waters, sewage, and trade wastes is likely to prove more important. (Anderson-Texas)

W73-04425

CONTROL OF THE ANAEROBIC DIGESTION PROCESS AND SUPPORTING UNIT PROCESSES,

Philadelphia Water Dept., Pa.

C. F. Guarino.

Water Research, Vol 6, p 503-505, 1972, 1 fig, 1 tab.

Descriptors: *Automation, *Sludge treatment, *Anaerobic digestion, Computer programs, *Pennsylvania, Pumping, Waste water treatment.

Identifiers: *Philadelphia.

The City of Philadelphia proposes to automate raw sludge pumping, sludge heating, and anaerobic digestion. The anaerobic digestion process is expected to present the most difficulty, so a joint effort with General Electric has been formed to produce a debugged computer program which will control the operation. The program will be evaluated and modified as operating experience is acquired. (Anderson-Texas)

W73-04430

SEPARATION OF ACTIVATED SLUDGE FROM MIXED LIQUOR USING A CONTINUOUS CENTRIFUGE,

Water Pollution Research Lab., Stevenage (England).

A. B. Wheatland.

Water Research, Vol 6, p 531, 1972, 1 tab.

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

Descriptors: *Turbidity, Biochemical oxygen demand, *Centrifugation, *Sludge treatment, Gravity, Settling basins, Waste water treatment, *Separation techniques, Activated sludge. Identifiers: *Supernatant, Power consumption.

A higher turbidity and BOD than gravity settled supernatant was found in centrifuged mixed liquor supernatant. The return sludge was found to have suffered from the large shear forces involved. In addition, prescreening was needed. Power consumption of centrifugation was deemed prohibitive. (Anderson-Texas)
W73-04431

SLUDGE DEWATERING TESTS WITH A BELT PRESS.
Ruhrverband, Essen (West Germany).
K. R. Imhoff.
Water Research, Vol 6, p 515-516, 1972, 2 fig.

Descriptors: *Dewatering, *Sludge treatment, *Separation techniques, Pulp and paper industry, *Sludge disposal, *Waste water treatment, Flocculation, Trickling filters. Identifiers: *Belt press.

Belt presses, originating in the paper industry, consist of a lower metal belt with meshes and an upper rubber belt. Belt speed and separation are variable. Primary and trickling filter sludges were dewatered with the presses more easily than primary and activated sludge mixtures. Flocculants are mixed prior to dewatering, and the metal belt is washed on the underpass. The sludge is stored in a conical pile where it dries to 60% solids in dry weather. Neither erosion nor offensive odors were noticed in the pilot tests. The upper layers of the sludge pile took on the appearance of soil while digestion continued on the interior. (Anderson-Texas)
W73-04432

STUDIES ON THE DESIGN DATA OF GRAVITY THICKENING,
Emscher genossenschaft, Essen (West Germany).
K-H. Kalbskopf.
Water Research, Vol 6, p 499-502, 1972, 6 fig, 1 ref.

Descriptors: *Sludge treatment, Pore pressure, Pore water, Solid wastes, Gravity, *Waste water treatment, *Design criteria, Mathematical studies. Identifiers: *Thickeners, Detention time.

Continuously operated thickeners, affected by important physical processes, are designed by considering overflow, solids, loading, detention time of solids in the compression zone and the attainable underflow concentration. For each sludge, the equilibrium between the consolidation pressure and the pore water pressure, hence the final solids concentration, is different. An example design calculation for a gravity thickener is included. (Anderson-Texas)
W73-04433

WATER TREATMENT PLANT FOR TODAY AND TOMORROW,
Fort Worth Water Dept., Tex.
P. E. Robinson, and O. C. Allen.
Public Works, Vol 103, No 10, p 72-73, October 1972, 2 fig.

Descriptors: *Waste water treatment, *Treatment facilities, Computers, Monitoring, Instrumentation, *Automation, Turbidity, Taste, Odor, Chemicals, *Texas. Identifiers: *Data logging, *Fort Worth (Tex).

The Rolling Hills Water Treatment Plant at Fort Worth, Texas, that will go into operation in the summer of 1973, is so instrumented that it could be computer controlled with data logging, if so

desired, at a future date. The total capacity can be doubled without adding to chemical facilities, administrative and laboratory building or high service pump station structure. Treatment in the plant will be for turbidity removal, taste and odor control when they occur, and for stabilization and disinfection. The water will be used as a major source for the City of Arlington and some 12 other communities having long-term contracts with the City of Fort Worth for treated water. (Morparia-Texas)
W73-04435

WHAT IS EXPECTED IN IN-PLANT CONTROL AND WASTE TREATMENT IN THE FUTURE, Weyerhaeuser Co., Tacoma, Wash.

T. R. Frost.
Tappi, Vol 55, No 8, p 1195-1197, August 1972.

Descriptors: *Industrial wastes, *Projections, *Waste water treatment, Legislation, Ecology, Effluent streams, Management, *Control.

A method for determining in-plant control and waste treatment needs consists of (1) assessing the environment, particularly the local environment, (2) assessing regulations, current and future, (3) assessing the effluent characteristics to be expected (4) identifying alternatives in process treatment, and control, and (5) selecting the best trade-offs. Because the shape of future regulations is highly uncertain, extrapolations to describe control and treatment systems for use in the future are also uncertain. In the event that a 'zero discharge' regulation becomes reality, 'closed loop' mills appear to be the only solution. Such mills have less flexibility and more control problems than current mills. (Anderson-Texas)
W73-04437

3-STAGE PONDS EARN PLAUDITS,

R. Goswami, and W. H. Busch.
Water and Wastes Engineering, Vol 9, No 4, p 40-43, April 1972, 3 fig, 6 ref.

Descriptors: *Lagoons, *Waste water treatment, Oxidation lagoons, Stabilization, Biochemical oxygen demand, Temperature, Alkalinity, Color, Odor, Phosphates, Nitrates, Algae, Detergents, Flora, Fauna, Treatment facilities, Hydrogen ion concentration. Identifiers: *Stabilization ponds.

To evaluate the effectiveness of series-operated lagoons in treating domestic waste, 3-stage waste stabilization ponds were studied in detail to include effects due to seasonal variations. Methodology included measuring parameters such as pH, temperature, total alkalinity, BOD, phosphate, nitrate, synthetic detergents, algae counts, and observation of physical determinants such as color, odor, ice formation, and presence of flora and fauna. Results indicate that, on the average, the first pond removed 86% of influent BOD; the first two ponds together removed 79% of the phosphate in the raw waste; most of the synthetic detergent was removed in the first pond. No correlation seemingly existed between data of phosphate and synthetic detergent in the raw waste; phosphate rather than nitrate was the limiting factor for growth of algae. Photosynthetic activity was deferred because of ice cover and algal concentrations increased with melting of the ice. There was no aesthetic problem in the form of odor in the vicinity of the treatment site. (Anderson-Texas)
W73-04438

ANDOVER SEWAGE-TREATMENT WORKS, C. E. Jones.

Water Pollution Control, Vol 71, No 4, p 335-347, 1972, 12 fig, 21 append.

Descriptors: *Sludge treatment, Treatment facilities, Pumping, Automation, Design criteria, Ef-

fuent, Sludge disposal, Aesthetics, *Waste water treatment, *Filtration.

Identifiers: *Biofiltration, Chemical treatment, *Andover (U.K.).

Two stage biofiltration with filter pressing of digested and chemically conditioned sludge describes the new treatment plant which will assist in Andover's expansion from 1700 to 48,000 people over the next 20 years. A new pumping station was also built, including automatic overflow weirs to high flow storage areas. The design criteria were better than required effluent and maximum flow flexibility. The effluent is disposed of in the River Anton; sludge is used for irrigation while wet or pressed, broken, and dried for disposal on farmland. Hot water and temperature control of the sludge is provided by combustion of digester gases. The aesthetic appeal of the plant has been enhanced by extensive use of natural hedge material to screen unsightly portions as well as furnish a more pleasing fence. (Anderson-Texas)
W73-04439

KINETIC BEHAVIOR OF MIXED POPULATIONS OF ACTIVATED SLUDGE,

Kansas State Univ., Manhattan. Dept. of Chemical Engineering.
S. Y. Chiu, L. T. Fan, I. C. Kao, and L. E. Erickson.
Biotechnology and Bioengineering, Vol XIV., No 2, p 179-199, 6 fig, 2 tab, 22 ref.

Descriptors: *Activated sludge, *Design criteria, Mathematical models, Growth rates, Bacteria, Sewage, *Waste water treatment, Kinetics. Identifiers: *Substrates, Dilution rates, Monod kinetic model.

The effects of dilution rate on the growth behavior of mixed microbial populations of sewage origin were studied. Steady-state experiments were conducted at various dilution rates using glucose as the growth limiting substrate. The steady-state behavior of the system was found to fit well with the steady-state equations based on the Monod Kinetic model with an organism decay term added. The results from both continuous and batch experiments were used to estimate the parameter values for the model. Values for the growth parameters changed significantly and systematically with cell population. Results suggested that different cell populations predominate at different steady-state dilution rates, with high dilution rates resulting in predominately fast-growing cells and low dilution rates resulting in predominately slow-growing cells. (Murphy-Texas)
W73-04441

EFFECT OF TURBULENCE ON BOD TESTING, H. I. Ali, and J. K. Bewtra.

Journal, Water Pollution Control Federation, Vol 44, No 9, p 1798-1807, September, 1972, 3 fig, 5 tab, 16 ref.

Descriptors: *Biochemical oxygen demand, Sampling, Biological treatment, Mixing, Nitrification, Oxidation, Wastes, Sludge, *Waste water treatment, *Turbulence. Identifiers: *Settled wastes.

Test samples from raw, settled, and biologically treated waste water were studied to determine the effect of mixing on the bio-oxidation rate of substrates normally tested under quiescent conditions. Nitrification was suppressed with ammonium chloride. Oxidation as a function of stirring speed increased to a maxima, then decreased slightly at ultra-high speeds irrespective of the type of sample studied. The increase in mixing apparently increases food transport to the cells, thus increasing the growth rate. This is particularly true of unsettled wastes. Therefore, data obtained under quiescent conditions should be interpreted cautiously when applied to design practices. (Anderson-Texas)

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Waste Treatment Processes—Group 5D

W73-04443

DRY GRAPHITE FILM PROTECTS TREATMENT PLANT UNITS.
For primary bibliographic entry see Field 08G.

W73-04444

THE CASE FOR HIGHER RATE WASTE WATER TREATMENT,
Black and Veatch, Kansas City, Mo.
B. L. Goodman.
Environmental Science and Technology, Vol 6, No 9, p 794-798, September 1972, 3 fig.

Descriptors: *Activated sludge, *Waste water treatment, *Design criteria, Design standards, Regulation, Treatment facilities, Mixing, Aeration, Biochemical oxygen demand, Bacteria, Sewage treatment, Volumetric analysis, *Water quality.
Identifiers: *Permissible loadings, *Aeration periods, Rational system design, Volumetric criteria, Regulatory agencies.

No 'universal' design standard for biological waste water treatment plant exists in the U.S. The nearest equivalent to this is the 'Recommended Standards for Sewage Works,' published by the Great Lakes-Upper Mississippi River Board of State Sanitary Engineers, frequently known as the 'Ten States Standard.' These standards are viewed by many states as the final word in the design of such plants. However, the contention exists that higher loadings for several variants of the activated sludge process of waste water treatment should be permitted. It has also been argued that these higher loadings would in no way deteriorate plant performance or effluent quality. Data supporting the practicality of higher loadings abounds in publications and has been available to regulatory agencies. However, a simple increase alone in the loadings will not take maximum advantage of the activated sludge process. The mode of mixing must also be altered. Many U.S. activated sludge plants are designed as plug flow which does not promote substantial mixing. In completely mixed aeration systems a far greater number of microbes are involved in the process. Accepted American standards for loading are shown to be 'over-cautious' in contrast to the demonstrated efficiencies of higher rate systems in many parts of the world. Adopting the proposals herein would substantially lower operating and maintenance costs. Not considered was the higher quality effluents possible. (Gottschalk-Texas)

W73-04445

DIRECT FILTRATION AN ECONOMIC ANSWER TO WATER TREATMENT NEEDS,
Camp Dresser and McKee, Boston, Mass.
J. F. Willis.
Public Works, Vol 103, No 11, p 87-89, November 1972, 2 fig.

Descriptors: *Filtration, *Automation, Pilot plant, Design criteria, Operating costs, Capital costs, *Massachusetts, *Treatment facilities, *Waste water treatment.
Identifiers: *Springfield (Mass), Sand filters.

Springfield, Massachusetts has planned the construction of a new 60 mgd dual-media filtration plant with provisions for an orderly expansion to 180 mgd to satisfy future needs. Investigations had precluded expanding the capacity of the existing slow sand filters because of the combination of two factors: labor costs and the inability to use mechanical equipment for cleaning the filters. A pilot plant study to determine the feasibility of direct filtration at high rates on dual-media filters gave positive results, and it was decided that the new filter plant would be of the direct filtration type. Economic studies indicated that for the first phase of construction, the dual-media filters should be operated in conjunction with the exist-

ing slow sand filters, but for future expansion, all slow sand filters should be replaced by dual-media filters. The plant will consist of a pretreatment section, the filter building, and a control building with all three elements housed in a continuous structure. To help minimize operating costs, automatic controls will be installed and the entire filtering operation will be automatic. (Murphy-Texas)

W73-04446

AWARD WINNING WATER TREATMENT PLANT FEATURES AUTOMATION,
Harwood Beebe Co.
P. E. Polk, and R. S. Hale.
Public Works, Vol 103, No 11, p 74-75, November 1972, 1 fig.

Descriptors: *Treatment facilities, *Automation, *Waste water treatment, Operations, Monitoring, Turbidity, Settling lagoons, Design, *South Carolina, *Filtration.

Identifiers: *Operation efficiency, Chemical treatment, Plant design, *Easley (So.Car).

The new water treatment plant at Easley, South Carolina, has placed the laboratory close to an automatic control facility to maximize operation efficiency and economy. Within 25 steps, 90 percent of the water treatment can be monitored. Turbidity is monitored manually, but once dosage is determined, the chemical feeders are paced by flow meters. Automatic filter shutdown in case of excessive turbidity or malfunction is provided. Also, a final effluent line sampler provides a continuous record of fluoride content, and an alarm sounds in the event of over or under dosage. The plant design features are conventional with respect to processing, except that the high rate Turbiflo Filtration Process is used. Other automatic features of the plant's operation are discussed. The plant's location on the lake that serves as its water source allows close monitoring of raw water quality. (Murphy-Texas)

W73-04447

LYSIMETRIC METHOD OF EXAMINING THE DEGREE OF DEHELMINTHIZATION OF SEWAGE (IN RUSSIAN),
Institute of Medical Parasitology and Tropical Medicine, Moscow (USSR).
Z. K. Drodzova, N. A. Romanenko, I. G. Lapshina, N. L. Andreeva, and N. I. Vlasova.
Med Parazitol Parazit Bolezn., Vol 40, No 6, p 683-685, 1971. Illus. English summary.
Identifiers: *Helminths, Irrigation, Lysimetric method, *Sewage, Soils, *Water reuse.

Complete dehelminthization of sewage occurred when it was used for irrigation of loamy soils. Eggs of helminths were held by the soil mainly in superficial layers. The resulting filtrate contained no helminth eggs.—Copyright 1972, Biological Abstracts, Inc.

W73-04448

AN EVALUATION OF PROCEDURES FOR ENUMERATING BACTERIA IN ACTIVATED SLUDGE,
Water Pollution Research Lab., Stevenage (England).

For primary bibliographic entry see Field 05A.
W73-04450

SLUDGE DISPOSAL-MY PROBLEM AND ITS SOLUTION: A SYMPOSIUM.

Water Pollution Control, Vol 71, No 4, p 386-388, 1972, 1 tab.

Descriptors: *Sludge disposal, Treatment facilities, Lagoons, Dry beds, *Land reclamation, Sludge, Waste water treatment, *Waste treatment.

Four papers concerning sludge disposal in the areas of Leicester, Mansfield, Sutton-in-Ashfield, and Warsop were presented and discussed. Plant start-up problems in Leicester prevented full-scale operation of their new composting plant, resulting in a redesign of the pumping and piping of sludge from the lagoons. Mechanical dewatering was hailed as the solution to overloaded drying beds in Mansfield. Sutton-in-Ashfield operators are pressing for the same, as cold and rain prevent efficient operation of their drying beds. Sophisticated scheduling, a collapsible aluminum pipe network, and extensive cooperation from local farmers has made a success of Warsop's land application program. (Anderson-Texas)

W73-04451

CONTROL OF COPPER ELECTROPLATING WASTES: AN ANNOTATED BIBLIOGRAPHY,
Vermont Univ., Burlington. Technical Information Center.
For primary bibliographic entry see Field 05G.
W73-04467

CONSTRUCTION OF WASTEWATER FACILITIES, RED OAK, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Dallas, Tex. Air and Water Programs Div.
For primary bibliographic entry see Field 05G.
W73-04468

THERMAL CONDITIONING TESTS OF ACTIVATED SLUDGE AND ANAEROBIC DIGESTION TEST OF THE FILTRATES,
Emachergenossenschaft, Essen (West Germany). K. H. Kalbskopf.
Water Research, Vol 6, p 517-520, 1972, 6 fig.

Descriptors: *Activated sludge, *Filters, Dewatering, Thermal capacity, Sludge digestion, *Waste water treatment, Waste treatment, *Anaerobic digestion.
Identifiers: Filter cake.

In order to produce filter cake with the highest possible thermal value, a study of heat treatment of excess sludge was made. Graphs of the filterability of sludge as a function of pretreatment temperature and of reaction time were the result. It is more economical to pre-treat the filtrates by digestion than to have simultaneous treatment of the filtrates in the activated sludge tank. (Anderson-Texas)

W73-04469

THE OPTIMUM FLOCCULANT CONCENTRATION FOR EFFECTIVE FLOCCULATION OF CHINA CLAY IN AQUEOUS SUSPENSION,
Salford Univ. (England). Dept. of Chemistry. D. Dollimore, and T. A. Horridge.
Water Research, Vol 6, p 703-710, 1972, 4 fig, 3 tab, 7 ref.

Descriptors: *Flocculation, Sedimentation, *Turbidity, Filtration, *Waste water treatment, Water treatment, *Settling velocity, *Optimization.
Identifiers: China clay, Polyacrylamide, Agitation.

Flocculation behavior of china clay-polyacrylamide suspensions was investigated by measuring the sedimentation rate, final settled volume of the flocs, turbidity of the supernatant and the filtration rate through the settled flocs. The results were plotted as flocculation parameters versus polyacrylamide concentration. A peak in the settled volume curve coincided with a peak in the percentage light transmission curve and a trough in the settled volume curve coincided with peaks in the filtration and sedimentation rate curves. The settled volumes of clays SPS-polyacrylamide and R1-polyacrylamide in deionized water were 62 cc and 51 cc respectively. (Anderson-Texas)

W73-04477

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

NEWER MEMBRANE CONCENTRATION PROCESSES AND THEIR APPLICATION TO THE DETECTION OF VIRAL POLLUTION OF WATERS,
Gulf South Research Inst., New Orleans, La. Environmental Virology and Microbiology Section.
R. D. Ellender, and B. H. Sweet.
Water Research, Vol 6, No 6, p 741-746, June 1972, 2 fig 4 tab.

Descriptors: *Viruses, *Separation techniques, Filtration, *Water reuse, Osmosis, Membranes, Water treatment, Salts, Cost analysis, *Waste water treatment, Sewage.
Identifiers: *Ultrafiltration.

Hyperfiltration using a new type of membrane is a potentially useful method for the concentration or separation of macromolecular material such as viruses. Two types of hyperfiltration systems are discussed. In pressure ultrafiltration the virus containing solution is pressurized and forced past the surface of a supported membrane. Water passes through the membrane and a concentrate is collected. In osmotic ultrafiltration water is removed from the solution through the membrane by direct osmosis. Osmotic ultrafiltration is a relatively inexpensive procedure but requires constant monitoring for salt buildup. Pressure ultrafiltration is the faster method but is more complex and therefore more expensive. Model systems for each type are shown and results of experiments demonstrate the ability of each to retain virus. The possible application of ultrafiltration processes to standard procedures for detecting virus in drinking water is mentioned. It is also noted that ultrafiltration is of growing importance in reclaiming water from sewage. (Murphy-Texas)
W73-04478

WASTEWATER RECLAMATION BY IRRIGATION.

Hawai Univ., Honolulu. Water Resources Research Center.
R. H. Young, P. C. Eken, and L. S. Lau.
Journal of the Water Pollution Control Federation, Vol 44, No 9, p 1808-1814, September 1972, 37 ref.

Descriptors: *Artificial recharge, *Hawaii, Storm runoff, Irrigation, *Water reuse, Recycling, Reclamation, Groundwater resources, Water pollution, Viruses, Domestic water, DDT, Domestic wastes, Water supply, Irrigation.
Identifiers: *Water renovation, *Waste water effluents, *Effluent disposal, *Lahu (Hawaii), Stream water recharge, Water budget, Percolate samples, Waste water borne viruses.

Estimations of growing water needs of the increasing population of Lahu, Hawaii, indicate a possible need for artificial reinforcement of available water resources in the near future. The possibility of water renovation and reuse by artificial recharge of groundwater with waste water effluents and stormwater runoff have been considered for some time by the local authorities. If the general public continues to reject direct reclamation of waste water as a potable supply the only use of reclaimed water will be for agricultural irrigation. However, this process has dangers; if this practice takes place over groundwater bovidae which are sources of domestic water, the pollutional effect of the effluent water must be calculated. Waste water farming reclaims not only the water, but also certain nutrients in the effluent. Process studies in the laboratory have been made to determine the single polluting elements. For the isolation and identification of contaminating viruses, standard procedures were used. This research should develop results pertinent to Hawaii regarding transmission of viruses and passage of dissolved materials under controlled conditions in which waste water effluents are applied to irrigate grass and sugar cane. Alternatives for regional management of water resources depend on this study. (Gottschalk-Texas)
W73-04480

PERFORMANCE OF DEEP TRICKLING FILTERS BY FIVE METHODS,
Central Public Health Engineering Research Inst., Nag Pur (India).
V. Hanumanulu.
Journal of the Water Pollution Control Federation, Vol 42, No 8, August 1970, p 1446-1457, 2 fig, 5 tab, 17 ref.

Descriptors: *Mathematical studies, *Trickling filters, Recirculated water, Biological treatment, Treatment facilities, *Waste water treatment, Theoretical analysis.

Identifiers: *Eckenfelder formula, *Ten states formula.

At the Dader-Bombay wastewater treatment plant there are three trickling filters with medium depth of 12 feet, one with recirculation and the other two without recirculation. The performance of these deep trickling filters was studied and compared with the theoretical performance predicted by the Velz, Ten States, National Research Council, Eckenfelder, and Galler and Gotaas formulas, to find out which method most closely approximates the actual performance of deep trickling filters both with and without recirculation. Results indicated that the Eckenfelder formula fitted best in the case of trickling filters with recirculation and was followed closely by the Galler and Gotaas formula. In the case of trickling filters without recirculation, the Ten States formula fitted best, followed by NRC and Velz. (Murphy-Texas)
W73-04486

REVERSE OSMOSIS FOR WASTEWATER TREATMENT,
Ontario Research Foundation, Toronto.
A. Golomb, and F. Besik.
Industrial Water Engineering, Vol 7, No 10, p 16-19, October, 1970, 4 fig.

Descriptors: *Reverse osmosis, *Water reuse, *Waste disposal, Pollution abatement, *Design, Industrial wastes, Acid mine water, Membrane, *Waste water treatment, Water quality, Pulp wastes.

Reverse osmosis may be regarded as a technique of separating the components of waste streams to accomplish one or more of the following: (1) reclamation of water for reuse, (2) concentration of the constituents of reuse for convenient disposal, or (3) abatement of pollution. Five types of reverse osmosis designs have evolved over the past few years: tubular units, spiral-wound units, plate and frame units, plate and frame (ultrafiltration) units, and hollow-fiber units. Each of these designs is discussed along with its advantages and disadvantages. The application of reverse osmosis to each of the following was pointed out: (1) spent liquors from the pulping industry, (2) acid mine drainage waters, (3) petrochemical complex wastewater, (4) electroplating waste streams, (5) cheese whey waste streams, (6) corn processing effluent, and high-salinity irrigation return flows. (Murphy-Texas)
W73-04487

TANNERY EFFLUENTS AND THEIR TREATMENT-CONCLUSION,
D. A. Bailey.

Effluent and Water Treatment Journal, Vol 10, p 330-339, June 1970, 3 fig, 2 tab, 3 ref.

Descriptors: *Tannery wastes, *Waste water treatment, Industrial wastes, Biological treatment, Filtration, Waste disposal, Landfills, Drying, Sludge disposal, Hydrogen ion concentration, Control.

Identifiers: *Hydrogen ion concentration control.

Pre-treatment of tannery wastes before discharge to sewers includes equalization, pH control, screening, skimming, removal of sulfide and removal of chromium. Vegetable tanning wastes

are easily biodegradable but differ radically from the characteristics of municipal sewage. Chromium tanning wastes have a lesser but real biological treatability. A high rate roughing filter can be used to good effect with either type of waste. Sludge disposal, the major problem for this industry, has been handled by drying beds and landfill. Rotary filters, filter presses, and incineration are envisioned for the future. (Anderson-Texas)
W73-04488

RATIONAL PROCESS DESIGN STANDARDS FOR AEROBIC OXIDATION PONDS IN AHMEDABAD, INDIA,

Central Public Health Engineering Research Inst., Ahmedabad (India). Field Centre.
I. S. Jayangoudar, V. Kothandaraman, V. P. Thergaonkar, and S. G. Shaik.
Journal of the Water Pollution Control Federation, Vol 42, No 8, p 1501-1514, August 1970, 7 tab, 22 ref.

Descriptors: *Water quality standards, *Oxidation lagoons, *Algae, Bacteria, Biological treatment, *Waste water treatment, Organic loading, Biochemical oxygen demand, Viruses, Nutrients, Aerobic bacteria, *Design, *Aerobic conditions.
Identifiers: *Ahmedabad (India).

In the design of aerobic ponds based on maximum algal production considering a total BOD design load, the primary factors involved are the operating temperatures, algal composition or unit heat of combustion, solar radiation corrected to sky clearance factor, and photosynthetic efficiency. Experimental results and solar radiation data from Ahmedabad, India, were used to calculate the following: (1) the ultimate influent and effluent BOD; (2) the total quantity of oxygen that must be produced for BOD satisfaction; (3) the quantity of algae that must be produced to liberate the required oxygen; (4) the total energy required to sustain algal growth; (5) the solar radiation available at Ahmedabad; and (6) the quantity of energy stored in the algal cells at 6% light conversion efficiency. From these results, the process design standards for oxidation ponds in Ahmedabad were worked out for the four seasons of 1962-63 and were summarized in tables. (Murphy-Texas)
W73-04496

ION EXCHANGE FOR THE METAL PRODUCTS FINISHER-PART I,
Rohm and Haas Co., Philadelphia, Pa. Research Labs.

R. Kunin.
Products Finishing, Vol 33, No 7, p 66-73, April 1969, 1 fig, 4 tab.

Descriptors: *Ion exchange, *Waste water treatment, *Resins, Electrolytes, Water quality, *Heavy metals, Water treatment, Separation techniques.
Identifiers: *Exchange resins.

During the ion exchange process, the ions between a water containing dissolved electrolytes and natural or synthetic ion exchange material are exchanged. Most synthetic ion exchange resins may be considered as cross-linked polyelectrolytes and they are based upon co-polymers of a vinyl compound such as styrene and a cross-linking agent such as divinyl benzene. Cation exchange resin or anion exchange resins can both be constructed. In the dry state or in non-polar solvents, the gel structure of the ion exchange resin is essentially in a collapsed state i.e. there is very little room for the diffusion of ions. Macro-reticular ion exchange resins permit one to conduct ion exchange operations effectively even in non-polar media. Practically all ion exchange reactions are reversible, the favored direction of ion exchange reactions being determined by the relative affinity of the ion exchanger for the ions entering into the exchange reaction. The kinetics of ion exchange is

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Ultimate Disposal of Wastes—Group 5E

determined by three diffusion processes. Ion exchange, by its very nature, is a purification technique. It is employed to remove trace impurities from the bulk of a substance, or in some other instances ion exchange materials are employed to separate closely related species into fractions, the examples being deionization of water and ion exchange chromatography respectively. The recovery of chromium, zinc, and copper by ion exchange has been limited to the treatment of waste streams. (Murphy-Texas)
W73-04497

POLLUTION CONTROL IN SULPHUR MINING.
Freeport Sulphur Co., Tex.
F. G. Deiler.
Industrial Water Engineering, Vol 7, No 8, p 14-17, August 1970. 4 fig.

Descriptors: Sulfur, *Waste water treatment, Industrial wastes, *Sulfides, *Salinity, Biological treatment, *Corrosion, Waste water disposal.
Identifiers: *Sulfur well bleedwater, Chemical treatment.

Sulfur well bleedwater is a high salinity liquid resembling seawater in composition except for hydrogen sulfide. Dissolved hydrogen sulfide must be removed before the sulfur well effluent can be safely discharged into coastal bays. Early treatment of the bleedwater by contacting it with flue gases required high electrical power consumption which decreased the plant operational capacity. The three-stage spray-retention-dilution process is described. Its principles form the basic structure of present day disposal of bleedwater. Possible chemical and bacteriological treatment of bleedwater is discussed. The extremely corrosive nature of bleedwater is noted, and corrosive resistant construction materials are discussed. (Murphy-Texas)
W73-04498

LAKE MICHIGAN CLEAN-UP LAGGING.

Chemical and Engineering News, Vol 50, No 40, p 35-36, October 2, 1972.

Descriptors: *Lake Michigan, *Industrial wastes, Sewage treatment, *Waste water treatment, Treatment facilities, Water pollution, Pollution abatement.

In 1968, the Lake Michigan Enforcement Conference set an ambitious clean-up goal which has since fallen behind schedule. Only 53 of the 145 municipal sewage works will meet the new requirements by the deadline. Seventy-nine percent of the industrial waste sources will be in compliance, but several are already under active investigation by the EPA's enforcement staff. The requirement of sewage disinfection has been met by all but four municipalities, one of which is South Bend, Indiana. The four EPA recommendations at the latest conference apply increased pressure on procrastinators. (Anderson-Texas)
W73-04547

REVERSE OSMOSIS CAN CUT COST OF WATER TREATMENT,
Gulf General Atomic, Inc., San Diego, Calif.
J. H. Myers.
Industrial Water Engineering, Vol 7, No 3, p 25-30, March 1970. 3 fig, 4 tab.

Descriptors: *Reverse osmosis, *Membrane processes, *Membranes, Design criteria, Economic feasibility, Capital costs, Operating costs, Cost comparisons, Ion exchange, *Desalination, Waste water treatment.
Identifiers: Membrane reliability.

Largely due to the mass production of uniform quality membranes, the number of industrial reverse osmosis installations has greatly increased in the past few years. Recently gathered in-plant experience has helped to insure good overall design and to determine economic feasibility. The components normally included in an RO installation are discussed along with the performance and life of the membrane and the reliability of the system. Capital and operating costs of RO equipment are presented. Tables illustrate an economic analysis to determine the feasibility of using reverse osmosis in place of ion exchange demineralization and for primary demineralization before ion exchange polishing. Substantial savings are indicated in favor of the reverse osmosis system. (Murphy-Texas)
W73-04549

TANNERY EFFLUENTS AND THEIR TREATMENT - PART I,
British Leather Manufacturers' Research Association, Egham (England).
D. A. Bailey.
Effluent and Water Treatment Journal, Vol 10, No 5, p 261-263, 1970.

Descriptors: Tannery wastes, *Waste treatment, Local governments, Regulation, Industrial wastes, Lime, *Waste water treatment, Effluents, *Sulphides.

Identifiers: *Pickling liquors, *Chromium removal.

Sources of liquid wastes in the tanning process are soaking water, dehairing and liming solutions, deliming and bathing liquors, pickling liquors, and vegetable or chromium tanning liquors. The characteristics of the combined effluent vary widely over the work day. Pre-treatment and specific contaminants removal such as sulfide or chromium removal may be required before discharge to sewers. Local authorities are obliged to accept trade but may impose acceptance conditions and may charge for acceptance. (Anderson-Texas)
W73-04550

5E. Ultimate Disposal of Wastes

WASTE WATER REUSE-A SUPPLEMENTAL SUPPLY,
Los Angeles County Sanitation District, Calif.
For primary bibliographic entry see Field 05D.
W73-03987

DEHYDRATED POULTRY WASTE IN POULTRY RATIONS,
British Columbia Univ., Vancouver.
J. Biely, R. Soong, L. Seier, and W. H. Pope.
Poultry Science, Vol 51, No 5, p 1502-1511, September, 1972, 16 tab, 10 ref.

Descriptors: *Recycling, *Waste disposal, *Feeds, *Odor, Cost analysis, Cost comparison, Economics, Environment, *Farm wastes, *Poultry.

Identifiers: *Dehydrated poultry waste.

Experiments were conducted in which dehydrated poultry waste (DPW) was fed to poultry in order to determine the extent to which it could be incorporated in rations for replacement chicks, broilers, and laying birds. The DPW, which contained less than 10 percent moisture, was mixed into rations containing from 5 to 30 percent DPW. Indications were that the inclusion of DPW in a well-balanced ration did not interfere with the normal physiological well-being of the birds. The growth and feed efficiency of the birds fed low levels of DPW compared favorably with those fed the control ration. However, levels of DPW beyond 10 percent adversely affected growth and feed efficiency.

Economic aspects of including DPW in poultry rations were discussed. It was noted that recycling poultry waste could mean a fairly odor-free operation and help prevent contamination of the environment. (Murphy-Texas)
W73-03992

POND CLEANING COST CUT 50 PERCENT BY AUGER-EQUIPPED BARGE.
For primary bibliographic entry see Field 05G.
W73-04004

HANDLING AND DISPOSAL OF CHEMICAL WASTES,
Weston (Roy F.), Inc., West Chester, Pa.
For primary bibliographic entry see Field 05D.
W73-04008

DOING TIME TAKES ON A NEW MEANING FOR THE WASTEMAKERS,
For primary bibliographic entry see Field 05G.
W73-04010

LEADING QUESTION,
For primary bibliographic entry see Field 05D.
W73-04017

STUDIES OF THE INFLUENCE OF LAGOONS AND LANDFILLS ON GROUNDWATER QUALITY,
South Dakota State Univ., Brookings. Water Resources Research Inst.
For primary bibliographic entry see Field 05B.
W73-04066

EXPERIENCES WITH THE SLUDGE PROGRAM IN THE DENVER AREA,
Denver Sewage Sludge Disposal District, Colo.
For primary bibliographic entry see Field 05D.
W73-04286

PROBLEMS AND OPPORTUNITIES IN WASTE HEAT DISPOSAL,
New York State Public Service Commission, Albany.
For primary bibliographic entry see Field 05G.
W73-04347

COASTAL CURRENTS OF PACIFIC NORTHWEST,
Utah Univ., Salt Lake City. Dept. of Civil Engineering.
For primary bibliographic entry see Field 05B.
W73-04364

DRIED ANIMAL WASTE AS A PROTEIN SUPPLEMENT FOR SHEEP,
Michigan State Univ., East Lansing.
P. Timminit, Y. Yu, K. McGuffey, and J. W. Thomas.
Journal of Animal Science, Vol 35, No 2, August 1972, p 431-435, 4 tab, 12 ref.

Descriptors: Waste disposal, Growth rates, *Protein, *Carbohydrates, Nutrients, Nitrogen, Soybeans, Sheep, *Farm wastes, Waste treatment.

Identifiers: Animal feces.

Since animal excreta contains considerable amounts of protein and carbohydrate, a study was conducted in which dehydrated feces from several sources were fed to sheep to ascertain their value as a nutrient source. Four digestion trials were conducted using dehydrated animal feces as 20 to 80 percent of a mixed ration. Soybean meal was used as a control source. Urine and feces from the sheep were collected daily and analyzed. The

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5E—Ultimate Disposal of Wastes

digestibility of ration nitrogen was 44 to 62 percent and all sheep were in positive nitrogen balance. Retention of digested nitrogen compared favorably with values for soybean meal rations. These digestibility trials indicated that ruminant, swine and poultry feces do have value as a nitrogen and energy source for sheep. The values are significantly high to suggest that these manures might be used in rations for fattening, growing, or breeding sheep. (Murphy-Texas)
W73-04449

SLUDGE DISPOSAL-MY PROBLEM AND ITS SOLUTION: A SYMPOSIUM.
For primary bibliographic entry see Field 05D.
W73-04451

FORMER CAMP PARKS SEWAGE DISPOSAL PLANT, PARCEL A-2 PLEASANTON, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
General Services Administration, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-04474

THE CLIVUS TOILET - SANITATION WITHOUT POLLUTION,
For primary bibliographic entry see Field 05G.
W73-04482

EFFLUENT STANDARDS AS PROPOSED BY THE ROYAL COMMISSION ON SEWAGE DISPOSAL,
Ouse and Hull River Authority, Leeds (England).
For primary bibliographic entry see Field 05G.
W73-04491

CONSTRUCTION OF WASTE-INJECTION MONITOR WELLS NEAR PENSACOLA, FLORIDA,
Geological Survey, Tallahassee, Fla.
J. B. Foster, and D. A. Goolsby.
Florida Bureau of Geology Information Circular No 74, 1972. 34 p, 16 fig, 7 tab, 7 ref.

Descriptors: *Injection wells, *Waste disposal wells, *Water quality, *Aquifer characteristics, *Florida, Chemical wastes, Chemical analysis, Salinity, Water pollution sources, Water pollution control, Groundwater movement, Infiltration, Monitoring, Aquifer testing, Hydrologic data, Data collections, Hydrostatic pressure.
Identifiers: *Pensacola (Fla).

The effects of injection of liquid chemical waste into the lower Floridian aquifer at a chemical plant near Pensacola, Florida, have been monitored since July 1963. Near the end of 1968, high concentrations of waste were found in water samples from the monitor well that tapped the aquifer receiving the waste. This monitor well was plugged in February 1969 to eliminate the possibility that acid waste might corrode the well casing and escape from the injection zone into the fresh water strata of the sand-and-gravel aquifer. Two additional monitor wells were drilled at distances 1.5 miles south and 1.9 miles north of the injection wells. The geologic and hydrologic data that pertain to the two monitor wells are presented. Included are records of drill cuttings, water samples, temperatures, rates of artesian flow, aquifer tests, geophysical logs, and chemical analyses. Results of the chemical analyses of water from the two monitor wells confirm that the water of the lower Floridian aquifer is highly saline and that it becomes increasingly saline with depth in the aquifer. Water samples taken during the construction period are believed to represent native aquifer water. Dissolved chemical constituents that would indicate the presence of injected chemical waste in the immediate areas of the monitor wells were not detected. (Woodard-USGS)

W73-04536

5F. Water Treatment and Quality Alteration

A COMPARATIVE STUDY OF THE INACTIVATION OF VIRUSES IN WATER BY CHLORINE,
Cincinnati Univ., Ohio. Dept. of Civil and Environmental Engineering.
P. V. Scarpino, G. Berg, S. L. Chang, D. Dahling, and M. Lucas.
Water Research, Vol 6, No 8, p 959-965, August 1972, 4 fig, 8 ref.

Descriptors: *Viruses, *Viricides, *E. Coli, *Chlorine, Neutralization, *Water treatment, *Waste water treatment, Chlorination, Water reuse.
Identifiers: *Poliovirus I, Hypochlorite ion, Hypochlorous acid.

Since information on the inactivation of viruses in water and waste water by chlorine both limited and lacking in standard testing conditions, carefully controlled experiments in this area were conducted at the National Environmental Research Center, Cincinnati. Poliovirus I and Escherichia coli were grown and prepared as stock for the tests, and attention was given to the preparation of the buffer, neutralizer and chlorine solution. The 99 percent inactivation point was used in six studies for poliovirus I and five for E. coli. Results indicated that, contrary to literature reports, the hypochlorite ion appears to be a more effective virucidal form of free chlorine than hypochlorous acid. (Murphy-Texas)
W73-03991

THE ROLE OF THE SPECIALIST WATER TREATMENT COMPANY,
S. E. J. Lindsey.
Water and Water Engineering, Vol 76, No 919, pa 324-326, September, 1972, 1 fig.

Descriptors: *Water treatment, *Waste water treatment, Pilot plants, Treatment facilities, Economics, Cost analysis, Pollution control, Specialization, Operation and maintenance.
Identifiers: *Turnkey contracts.

Specialist water treatment companies relieve their clients of problems beyond their capacity, expertise, or interest. Years of experience result in quick solutions that are usually better than those designed carefully and particularly by would-be clients. Turnkey contracts are the ultimate service provided, but consultation, design, supply, and installation are all available separately. The turnkey contract has the advantage of protecting the client against unsatisfactory performance. Specialist companies provide services abroad through subsidiary companies and training programs. Subsidiaries usually rely heavily on their principal's information and equipment. (Anderson-Texas)
W73-04002

DETERMINATION OF HYDROCARBON RESIDUES IN WATER,
Geneva Cantonal Lab. of Chemistry (Switzerland).
For primary bibliographic entry see Field 05A.
W73-04007

METHOD AND APPARATUS FOR SOFTENING OR DESALTING WATER BY ION EXCHANGE,
GHH-MAN Technik Gesellschaft fuer Anlagenbau m.b.H., Essen (West Germany).
For primary bibliographic entry see Field 03A.
W73-04133

REVERSE OSMOSIS WATER PURIFIER,
Polymetrics, Inc., San Carlos, Calif. (assignee).
For primary bibliographic entry see Field 03A.

W73-04135

METHOD AND APPARATUS FOR WATER SOFTENING,
Ecodyne Corp., Chicago, Ill. (assignee).
For primary bibliographic entry see Field 03A.
W73-04145

GKN'S NEW WATER AND WASTE TREATMENT DIVISION.
For primary bibliographic entry see Field 05D.
W73-04155

WATER PURIFICATION FOR BEVERAGE PROCESSING,
N. H. Mermelstein.

Food Technol, Vol 26, No 2, p 47-49, 1972, Illus.
Identifiers: *Beverage processing, Food processing, Water purification, Activated carbon, Soft drink manufacturing, *Water treatment.

Municipal water must often be further treated to make it suitable for use in food and beverage processing. The water treatment system utilized by a major soft drink manufacturer is described. Special emphasis is given to activated carbon absorption.—Copyright 1972, Biological Abstracts, Inc.
W73-04170

DIFFERENCES OF BACTERIAL GROUPS OF NUTRIENT MEDIA IN THE DETERMINATION OF GERM GROUPS IN WATER (IN GERMAN),
Mainz Univ. (West Germany). Hygiene Institut.
For primary bibliographic entry see Field 05A.
W73-04257

AUSTRALIAN SIROTHERM PROCESS REMOVES SALT FROM BRACKISH WATER,
R. Scambary.
Water and Water Engineering, Vol 76, No 919, p 327-329, September 1972, 4 fig.

Descriptors: *Desalination, *Desalination apparatus, *Desalination plants, Desalination processes, Ion exchange, Resins, *Water treatment, Cost analysis, Pilot plants.
Identifiers: *Australia, Borehole water, *Sirotetherm process.

A thermally regenerated ion exchange resin produces drinking water or pre-boiler feed without the cost of regenerant chemicals. The process is not intended for sea water, but has been applied on a pilot scale to inland brackish sources. Further development needs are water pretreatment studies and resin life trials. (Anderson-Texas)
W73-04285

RADIOACTIVE WASTES,
For primary bibliographic entry see Field 05D.
W73-04312

NEWER MEMBRANE CONCENTRATION PROCESSES AND THEIR APPLICATION TO THE DETECTION OF VIRAL POLLUTION OF WATERS,
Gulf South Research Inst., New Orleans, La. Environmental Virology and Microbiology Section.

R. D. Ellender, and B. H. Sweet.
Water Research, Vol 6, Nos 4/5, p 741-746, April/May 1972. 2 fig, 4 tab.

Descriptors: *Viruses, *Separation techniques, *Methodology, *Permselective membranes, Filtration, Laboratory equipment, Membrane processes, Pollutant identification, Microorganisms, *Water treatment, Design.

Identifiers: *Pressure ultrafiltration, *Membrane filters, *Osmotic ultrafiltration, Recovery, Sample preparation, Detection limits.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

Two ultrafiltration membrane systems, pressure ultrafiltration (PF) and osmotic ultrafiltration (OF), were tested for their ability to remove viruses from large volumes of water. Both systems operate by dehydrating viral solutions and trapping the viruses on filters. The OF method is suited for recovery of viruses when high inputs of viruses (above 1 PFU per ml) are concentrated from distilled water rather than tap water; in this case, recovery is between 80 to 100 percent. The PF method is superior to the OF method because the speed of concentration is much faster, there is no rejection of salts which eliminates any potential buildup of interfering complexes during the filtration process. The virus recovery by the PF system is over 99 percent with a viral input of 30,000 per ml. The design of both systems is included. (Long-Battle) W73-04390

OZONE ACTIVE CARBON TREATMENT OF SEA WATER FOR SWIMMING POOLS, (IN GERMAN).
Kiel Univ. (West Germany). Hygiene-Institut.
For primary bibliographic entry see Field 05D.
W73-04411

COOLING WATER CHLORINATION AND PRODUCTIVITY OF ENTRAINED PHYTOPLANKTON,
Woods Hole Oceanographic Institution, Mass.
F. J. Carpenter, B. B. Peck, and S. J. Anderson.
Marine Biology, Vol 16, No 1, p 37-40, September
1972, 1 tab, 9 ref.

Descriptors: *Cooling waters, *Chlorine, *Phytoplankton, Water reuse, Entrainment, *Water treatment, Fouling, *Chlorination, Waste water treatment.

Identifiers: *Biocide entrained phytoplankton, Chlorine concentrations.

A study was conducted to measure the effect of different concentrations of chlorine on productivity of coastal phytoplankton and to observe whether chlorine could be applied in doses strong enough to reduce fouling organisms, yet low enough to handle entrained phytoplankton unharmed. Chlorine concentrations considerably below those required to eliminate fouling organisms produced large decreases in the productivity of entrained phytoplankton. At the highest concentration of 1.2 ppm at intake and 0.4 residual at discharge, productivity was decreased by 83%. At the lowest concentration of 0.1 ppm at intake with residual discharge too low for measurement, productivity decreased by 79%. Thus, reduction of chlorine concentration by over an order of magnitude produced no essential reduction in the damage to entrained phytoplankton. These results indicated that chlorine cannot be used effectively as a biocide for fouling organisms in cooling systems without adversely affecting entrained phytoplankton. (Murphy-Texas)
W73-04427

HIGHER STANDARDS: THE LOCAL AUTHORITIES VIEW,
West Hertfordshire Main Drainage Authority,
Rickmansworth (England).
R. Wood.
Water Pollution Control, Vol 68, Part 3, p 333-338,
1969, 2 tab, 4 ref.

Descriptors: *Water quality standards, *Projects, *Standards, River regulation, Waste water treatment, Tertiary treatment, Cost analysis.
Identifiers: *Great Britain.

The greatest boon to river water quality would be compliance with already existing standards, but it may well be that specific situations require higher standards. Previous agreements by local authorities with industries may require legislative action for their termination. In long range planning,

authorities must be aware that once a 10:10 standard is set, tertiary treatment is implied. The cost of compliance and enforcement must be recognized as well as the possibility of involuntary non-compliance as a result of factors beyond the control of plant operators. The final question of who is to pay is not clean cut, being affected by traditional legal structures and specific local situations. (Anderson-Texas)
W73-04492

5G. Water Quality Control

SALINITY PROBLEMS IN ARID LANDS IRRIGATION: A LITERATURE REVIEW AND SELECTED BIBLIOGRAPHY,
Arizona Univ., Tucson. Inst. of Arid Lands Research.
For primary bibliographic entry see Field 03C.
W73-03910

BOLD NEW DEVELOPMENT FOR IRRIGATION,
For primary bibliographic entry see Field 03F.
W73-03956

IRRIGATION GUESSWORK - GOODBYE,
Bureau of Reclamation, Denver, Colo. Region 7.
For primary bibliographic entry see Field 03F.
W73-03962

SOIL-WATER RELATIONSHIP,
For primary bibliographic entry see Field 03F.
W73-03981

POND CLEANING COST CUT 50 PERCENT BY AUGER-EQUIPPED BARGE.

Chemical Processing, Vol 35, No 6, p 58, June, 1972.

Descriptors: *Solid wastes, *Settling basins, *Sludge disposal, Landfill, Flotation, Waste disposal, Cost analysis, *Cost comparisons, Economics, *Georgia.

Identifiers: Dow Chemical Company, *Dalton (Georgia).

The build-up of solids in three settling ponds at Dow Chemical Company, Dalton, Georgia, reached the level where maintenance was required. Projected cost for sludge removal by drag line and trucking to a land fill site limited cleaning to one pond per year. A less costly and more efficient method made use of a 28-foot flotation barge which was equipped with a boom-mounted auger assembly that lowered into the water. As the auger turns, solids from the pond bottom are forced into an intake tube. Suction pumps then push the solids through a discharge pipe to a spoil basin 700 ft. away. Setting up the barge and flotation pipes was completed in less than one day, and two men could operate the unit. The cost of this operation was approximately half that of a drag line and trucking operation, and the pond remained in use during the entire cleaning procedure. (Murphy-Texas)
W73-04004

DOING TIME TAKES ON A NEW MEANING FOR THE WASTEMAKERS,
T. Morse.

The Engineer, Vol 235, No 6076/7, p 33-35, August 1972, 4 fig, 2 ref.

Descriptors: *Environmental control, *Environmental effects, *Waste disposal, Regulation, Industrial wastes, Municipal wastes, Domestic wastes, Environment, Industry.

Identifiers: *Governmental control, Private enterprise, *Deposit of Poisonous Waste Act 1972, *Great Britain.

The Deposit of Poisonous Waste Act of 1972 and its implications if rigidly implemented are described. The act has potentials to penalize the depositing on land of poisonous, noxious or polluting waste so as to give rise to an environmental hazard, and to make offenders liable for any resultant damage. The act also requires advance notice of the removal and deposit of waste. Although not yet strictly imposed, could the act prove effective. Machinery must exist for industry and the authorities to work the act. The establishment of a central supervisory authority to inspect the waste disposal activities is recommended. Proper code of practice, if coupled with the act, could prove helpful. And most of all, the planning of complexes to handle domestic and industrial wastes on the part of private enterprises should be encouraged for the success of this 1972 act. (Morpia-Texas)
W73-04010

PUMPED STORAGE AND TIDAL POWER IN ENERGY SYSTEMS,
Haswell (Charles) and Partners, London (England).

C. K. Haswell, S. W. Huntington, T. L. Shaw, G. R. Thorpe, and L. J. Westwood.
Journal of the Power Division, American Society of Civil Engineers, Vol 98, No P02. Paper 9297, p 201-220, October, 1972, 4 fig, 26 ref.

Descriptors: *Tidal powerplants, *Pumped storage, *Hydroelectric power, *Powerplants, Estuaries, Electricity, Turbines, Pumps, Energy, Economics, Electric power demand, Navigation, Tidal energy.

Identifiers: *Electric networks, England, Severn estuary.

Tidal power has repeatedly been shown to be an unacceptably expensive energy source. A changing position is foreseen resulting from a substantial increase in nuclear installations, an associated dependence on pumped storage, escalating costs and concern over the supply of fossil fuels. Tidal power may be harnessed and combined with energy of thermal origin in a two-basin estuary pumped storage project, to give firm output and peaking potential with inherent hydro flexibility. The comparative simplicity of the total system, compactness and freedom from demands on land are distinct features. (Oleszkiewicz-Vanderbilt)
W73-04033

LOGICAL APPROACHES TO POWER SUPPLY AND ENVIRONMENT,
Black and Veatch, Kansas City, Mo. Power Div. R. D. Woodson.
Journal of the Power Division, American Society of Civil Engineers, Vol 98, No P02. Paper 9257, p 181-186, October 1972.

Descriptors: *Electric power production, *Heat, *Environmental effects, Powerplants, Sites, *Thermal pollution, Thermal powerplants, Water pollution, Systems analysis, Economics, Fossil fuels, Cooling, Cooling towers, Waste disposal, Engineering, Environmental Engineering.

Identifiers: *Waste heat, *Site selection.

Electric power supply systems can have both direct and indirect impact on the environment. Their design for compatibility with the environment requires a logical and systematic approach to the problem by engineers, the application of a much broader field of specialized knowledge than is generally included in the traditional engineering professions, a coordinated cooperative dialogue between the project managers and representatives of the public, and the mature judgment of experienced persons. Alternate land uses must be

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

given emphasis in siting, and locations remote from river valleys, public water bodies, urban areas, and airports should be considered. Special attention should be given to plant orientation, architecture, waste disposal, sound levels, and the overall impact on the region and its facilities. (Oleszkiewicz-Vanderbilt)
W73-04036

TIDAL ENERGY FROM THE BAY OF FUNDY,
Bristol Univ. (England).
For primary bibliographic entry see Field 08A.
W73-04041

PESTICIDE REGULATIONS AND RESIDUE PROBLEMS IN JAPAN,
National Inst. for Agricultural Sciences, Tokyo (Japan).
For primary bibliographic entry see Field 05B.
W73-04042

MERCURY POLLUTION,
Chemap A.G., Mammendorf (Switzerland).
For primary bibliographic entry see Field 05B.
W73-04055

OPTIMAL PRICING POLICIES FOR CONJUNCTIVE URBAN WATER SUPPLY AND WASTE WATER TREATMENT SYSTEMS,
Environmental Dynamics, Inc., Los Angeles, Calif.

S. E. Jacobsen, and J. L. Midler.
Available from the National Technical Information Service as PB-214 204, \$3.00 in paper copy, \$0.95 in microfiche. Completion Report, October 1972. 77 p, 5 fig, 12 tab, 23 ref, 2 append. OWRR C-3265 (No 3711) (1). 14-31-0001-3711.

Descriptors: *Pollution taxes (Charges), *Water rates, *Water quality control, *Optimization, Economics, *Pollution abatement, Model studies, Computer programs, *Mathematical models, Industrial wastes, Waste water disposal, Conjunctive use.

Industries which withdraw stream water for their production processes and then discharge their waste water to these streams cause much of the industrial water pollution. The problem is further complicated by the fact that seldom are significant central treatment facilities available. A mathematical programming model is developed for the purpose of computing water prices and waste water disposal prices; these prices are jointly determined and lead to a cleaner stream. The objective function is users' willingness-to-pay for the water services of the region.
W73-04060

A DYNAMIC PROGRAMMING STUDY OF VARIOUS DIVERSION LOSSES,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 04A.
W73-04068

A PROCEDURE AND CASE STUDY DEMONSTRATIONS FOR EVALUATING THE COST OF THERMAL EFFLUENT CONTROL FOR PROPOSED STEAM-ELECTRIC GENERATING UNITS,
Center for the Environment and Man, Inc., Hartford, Conn.

F. A. Smith, and L. Ortolan.
Available from the National Technical Information Service as PB-214 207, \$3.00 in paper copy, \$0.95 in microfiche. CEM Report No. 4059-465, May 1972. 59p, 3 fig, 14 tab, 32 ref, 4 append. EPA Program 16130 ERN 05/72-1. EPA-WQO Contract No. 14-12-037.

Descriptors: *Economic prediction, *Economics, *Cost-benefit analysis, *Thermal powerplants, *Cost, Electric power production, Electric power demand, Heat, *Thermal pollution, Nuclear powerplants, Model studies, Cooling, Cooling towers, Water pollution.
Identifiers: *Waste heat, *Waste heat utilization.

This study has developed a conceptual approach and operational procedure for evaluating alternative thermal effluent modification programs and estimating the generating station incremental costs of achieving alternative effluent standards. The most important conclusions pertaining to the procedure itself are that: (1) it has been demonstrated by application to two case study plants and shown to be feasible and operational, and, (2) in its present form the procedure has produced design results that are generally consistent with those observed in practice, and cost results that appear consistent with hypothesized functional relationships and of the correct general orders of magnitude consistent with various cost input parameters. As expected on the basis of economic theory, thermal effluent modification costs increase at an increasing rate as functions of both decreases in design effluent temperature and decreases in design effluent flow rate with respect to base values of these effluent characteristics generally encountered in the northeastern United States. (See also W73-04071) (Oleszkiewicz - Vanderbilt)
W73-04070

A PROCEDURE FOR ESTIMATING COSTS OF THERMAL EFFLUENT MODIFICATIONS FOR EXISTING STEAM-ELECTRIC GENERATING STATIONS,
Center for the Environment and Man, Inc., Hartford, Conn.

L. Ortolan, and F. A. Smith.
Available from the National Technical Information Service as PB-214 123, \$3.00 in paper copy, \$0.95 in microfiche. CEM Report No. 4059-464, May 1972. 38 p, 7 fig, 2 ref. EPA Program 16130 ERN 05/72-2. EPA WQO Contract 14-12-837.

Descriptors: *Thermal powerplants, *Economic predictions, *Cost-benefit analysis, *Costs, *Thermal pollution, Water pollution, Heat, Heated water, Cooling, Electric power production, Heat transfer, Mathematics, Computer models.

Identifiers: *Heat rejection, *Waste heat.

Possible changes are analyzed that could be made in privately optimal designs to modify heated effluents so that they conform with thermal quality standards; the latter are specified in terms of maximum allowable combinations of discharge flow rate and temperature. The objectives of the method of analysis presented is the determination of that combination of effluent modification options which meets the standard at minimum cost, subject to a constraint on total energy output. It is postulated that all effluent modification options that might be economically feasible can be divided into two classes, namely, reductions in energy output for the plant in question, and changes in the cooling system. The method of analysis developed and progress made in making this method operational are reported. Due to several unanticipated difficulties it was not possible to carry this portion of the work to a final state, and so there are no numerical results or illustrative case studies to report. (See also W73-04070) (Oleszkiewicz - Vanderbilt)
W73-04071

EFFECTS OF PROPOSED RUNWAY EXTENSIONS AT LAGUARDIA AIRPORT ON TIDES, CURRENTS, SHOALING, AND DYE DISPERSION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.

For primary bibliographic entry see Field 08B.
W73-04096

METHOD AND APPARATUS FOR CONTROLLING SUBNATANT OIL SEEPAGE,
W. H. Hyde.

U.S. Patent No. 3,681,923, 5 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 901, No 2, p 450, August 8, 1972.

Descriptors: *Patents, Oil industry, *Oil pollution, Water pollution sources, *Seepage, *Seepage control, Leakage, Equipment, *Pollution abatement, Water quality control, Water pollution control.
Identifiers: *Water pollution prevention, *Oil seepage.

The apparatus consists of a receptacle open at its bottom to overlie the floor area from which oil seepage is or may be present. A conduit connected with the receptacle carries the seepage to the surface of the water for safe storage. The seepage control apparatus is installed or erected at the time that an oil well is constructed. It can be built in structural association with an oil well already in existence and for this purpose any conventional construction techniques usually employed in the oil well industry can be followed. (Sinha-OEIS)
W73-04128

OIL SPILLAGE CONTROL PROCESS,
Membrionics Corp., New York (assignee).
J. Orban, and J. Brooks.

U.S. Patent No 3,681,237, 4 p, 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 901, No 1, p 274, August 1, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Equipment, Separation techniques, *Pollution abatement, Water pollution control.
Identifiers: *Foam material, *Water pollution prevention, Hydrophobic-oleophilic.

This method comprises sweeping or drawing over the oil spill a coated open cell foam material which sorbs in on and on the foam. The cells are coated with a hydrophobic-oleophilic composition and an antifungal anti-bacterial agent. The sorbed oil is squeezed out by passing it between mechanical rollers. (Sinha-OEIS)
W73-04129

OIL COLLECTION BOOM,
M. F. Smith.

U.S. Patent No 3,679,058, 4 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 900, No 4, p 1372, July 25, 1972.

Descriptors: *Patents, *Oil spills, *Oil pollution, Polymers, *Pollution abatement, Water pollution, Water pollution control, Equipment, Separation techniques.

Identifiers: Polyurethane foam, *Water pollution prevention.

This oil collection boom comprises an elongated flat tubular sleeve of polymer netting enclosing flat elongated slabs or bats of picker-lap fibrous polymer material. A tension-bearing rope or cable is positioned within the tubular sleeve alongside the absorbent bats to reinforce the structure. After trapping oil within the porous interspaces of the boom or belt material, it is squeezed between pinch rolls to force out and recover the trapped oil. An alternative embodiment of this patent provides for a continuous, wide, flat sheet of extremely porous hydrophobic foam material such as fully reticulated polyurethane foam, suspended from overlying buoyant flotation material. It may be formed into an elongated boom or into a continuous endless belt repeatedly cycled through the oil. (Sinha-OEIS)
W73-04134

AES NEW ENGLAND COUNCIL SPONSORS FIRST WASTE TREATMENT CONFERENCE.

Plating, Vol 58, p 914-916, September, 1971.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

Descriptors: "Waste water treatment, *Waste treatment, Environment, Equipment, Technology. Identifiers: American electroplater's society.

The American Electroplater's Society New England Council's conference focused on environmental and waste treatment problems. Host companies set up semi-public displays of new equipment, followed by a technical information service through which literature was distributed. The actual conference consisted of numerous technical discussions and speeches. The panel discussions afforded opportunities to relate the information to other fields. (Anderson-Texas) W73-04154

THE BIO-GAS PLANT: GENERATING METHANE FROM ORGANIC WASTES,
R. B. Singh.
Compost Science, Vol 13, No 1, p 20-24, January-February, 1972, 3 fig.

Descriptors: "Organic wastes, *Farm wastes, Methane, Fertilizers, Fermentation, Methane bacteria, Feeding rates, Economics. Identifiers: "Bio-gas, *Effluent slurry, *Gas collection, Decomposed matter, Digestor, Agitation.

Bio-gas, produced from farm wastes such as dung and corn husks, is very similar to natural gas and may be used for similar applications. In designing a bio-gas plant the following options, in order of importance, should be considered: (1) production requirements, (2) size of plant, (3) availability of raw material, and (4) suitability of raw material. Production requirements, when considered together with the availability and suitability of the raw material will determine the amount and type of raw material to be used. Although farmers are in no rush to build bio-gas plants, there is much economy and practicality involved here. (Gottschalk-Texas) W73-04157

EFFECTS OF IRRIGATION, MANGANESE SULPHATE AND SULPHUR APPLICATIONS ON COMMON SCAB OF THE POTATO,
Loughry Agricultural Coll., Cookstown (Northern Ireland).

E. D. Barnes.
North Irele Minist Agric Rec Agric. 20, p 35-44, 1972.

Identifiers: Irrigation, *Manganese sulfate treatments, *Potato scab, Streptomyces-Scabies, *Sulfur treatments.

The development of common scab (Streptomyces scabies) on potato crops grown in slightly acid to neutral soils was found to be greatly reduced by irrigation. The necessity for irrigation at or immediately following tuber initiation indicated. Irrigation for a period of 3 wk is suggested as being sufficient for good scab control in most years for seed production. The incidence of common scab was not significantly reduced by the application of MnSO₄. The total yield of tubers was significantly reduced by 125.5 kg/ha (112 lb/acre) MnSO₄ dusted on the tubers and applied as a spray. Applications reduced the incidence of both common scab and powdery scab. It is suggested that soil pH values of less than pH 5.4 must be obtained in order to achieve a substantial reduction in common scab by the application of S. Effective control was obtained at soil pH values lower than pH 5.2. (See also W73-04168) ± Copyright 1972, Biological Abstracts, Inc. W73-04167

COMMON POTATO SCAB: EFFECTS OF IRRIGATION, MANGANESE SULPHATE AND SULPHUR TREATMENTS FOR COMMON POTATO SCAB ON MINERAL COMPOSITION OF PLANT MATERIAL AND SOIL EXTRACTS,
Loughry Agricultural Coll., Cookstown (Northern Ireland). E. D. Barnes, and J. S. V. McAllister.

North Irele Minist Agric Rec Agric. 20, p 53-58, 1972.

Identifiers: Irrigation, *Manganese sulfate treatments, Minerals, *Potato scab, Soils, Streptomyces-Scabies, *Sulfur treatments.

The levels of Mn in potato plant material—foliage, tuber skins and tuber flesh—were significantly increased by S and MnSO₄ treatments. This effect does not appear to be related to the control of common scab given by S treatments. Ca to K ratios were reduced, sometimes significantly so, by S and irrigation treatments. The relationship between common scab and the C to K ratio of tuber skins is discussed. (See also W73-04167) Copyright 1972, Biological Abstracts, Inc. W73-04168

AIR AND WATER POLLUTION.

Symposium, Colorado Associated University Press: Boulder, Colo., 613p. Illus. Maps, 1972. Pr. \$12.95. Identifiers: *Air pollution, Biota, Pollution, *Symposium, *Water pollution.

This book contains the proceedings of a conference held at the University of Colorado, from Aug. 3-15, 1970. The contributed papers provide a survey of the present state of the various disciplines related to air and water pollution, with emphasis on the unanswered basic and applied research questions. Part 1, involving water pollution, discusses the effects of water pollutants on biota and physical and chemical phenomena in water and waste-water treatment. Part 2, dealing with air pollution, considers tropospheric chemistry, local pollution dispersion studies, global effects of air pollution and effects of air pollution on biota. This publication reviews a broad spectrum of problems, and no attempt was made to present a comprehensive review of any particular problem area. (Copyright 1972, Biological Abstracts, Inc. W73-04178)

RADIOACTIVE WASTES,
Minnesota Univ., Minneapolis.
For primary bibliographic entry see Field 05B. W73-04239

OUTCRY OVER EXPOSURE GUIDELINES,
Oak Ridge National Lab., Tenn.
J. A. Auxier.
Nuclear Safety, Vol 12, No 5, p 456-460, Sept. Oct. 1971, 22 ref.

Descriptors: *Nuclear wastes, *Nuclear powerplants, *Public health, Radioactivity effects, Water pollution effects, Standards, Regulation.

Hypotheses and assumptions of those critical of the radiation-exposure standards and guidelines, as well as those who maintain that the recommended dose levels are adequately low are discussed. Current contamination levels are so low, relative to the guidelines, that exposure levels will not reach 10% of the recommended limits during the next few decades. Thus the average population dose would still be below the 10-fold reduction recommended by the critics, if future research warrants such a reduction. (Bopp-ORNL) W73-04314

CONFERENCE ON BENEFICIAL USES OF THERMAL DISCHARGES.

Proceedings of Conference held September 17-18, 1970, Albany, N.Y. New York State Department of Environmental Conservation, Albany, N.Y. (1970). S. P. Mathur and R. Stewart, editors. 227p.

Descriptors: *Heat, *Thermal pollution, *Fish farming, *Agriculture, *Thermal powerplants, Temperature, Environmental effects, Heated water, Water pollution, Powerplants, Greenhouses, Heating, Cooling, Marine fisheries, Fish-

ries, Fish hatcheries, Geothermal studies, Aquaculture, Beneficial use.

Identifiers: *Waste heat, Heat uses, *Thermal discharges, Mariculture, Carrying capacity.

The New York State Department of Environmental Conservation organized the Conference in order to learn more about specific practical ways to which the surplus heat discharged from thermal powerplants can be put to productive use. The first technical paper deals with the trends in power generation and the outlook for surplus heat in the immediate future. The rest of the Conference is devoted to specific uses of thermal discharges. These specific uses include aquaculture in Scotland, mariculture in Japan, catfish farming, agricultural uses, space-heating in Iceland, greenhouses, agro-industrial and urban uses and combination urban-power systems. (See W73-04338 thru W73-04351) (Oleszkiewicz-Vanderbilt) W73-04337

TRENDS OF POWER GENERATION AND THERMAL DISCHARGES IN NEW YORK STATE,

General Electric Co., Schenectady, New York.

D. H. Brown.

In: Proceedings of Conference on the Beneficial Uses of Thermal Discharges, 17-18 September 1970, New York State Dept. of Environmental Conservation, Albany, N.Y., 1970, p 8-18. 2 fig, 6 tab, 7 ref, 2 Appendices.

Descriptors: *New York, *Thermal powerplants, *Thermal pollution, *Electric power production, Electric power demand, Forecasting, Water quality, Water quality standards, Heat, Temperature, Cooling, Cooling towers, Heated water, Environmental effects.

Identifiers: *Thermal discharges, *Heat uses.

Trends in steam-electric power generation in New York State show a growth rate of 5.3% annually with nuclear power plants being added in preference to fossil fired plants. Within existing state criteria for thermal discharges to natural waters it is forecast that the next twenty years of growth could be accommodated without cooling ponds or cooling towers. Should those criteria be changed drastically, then cooling towers would predominate. The requirement for thermal exhaust was reviewed, and the variations with exhaust temperature levels that might be mandated by specific beneficial uses presented. Comparisons to the solar input were made as a crude evaluation of environmental proportionality. (See also W73-04337) (Oleszkiewicz-Vanderbilt) W73-04338

DEVELOPMENT OF SYSTEMS IN MARINE FISH CULTIVATION IN THE UNITED KINGDOM,

White Fish Authority, London (England).

I. D. Richardson.

In: Proceedings of Conference on Beneficial Uses of Thermal Discharges, 17-18 September 1970, New York Dept. of Environmental Conservation, Albany, N.Y., (1970), p 19-28, 10 ref.

Descriptors: *Fish farming, *Fish hatcheries, *Heated water, *Thermal powerplants, Powerplants, Thermal pollution, Water pollution, Fish food organisms, Fish reproduction, Fish diseases, Fisheries, Foods, Water quality, Physicochemical properties, Environmental effects, Marine fisheries, Beneficial use.

Identifiers: *Waste heat, *Heat utilization.

Starting in 1963 with the erection of an experimental hatchery to develop a costed technology for hatching plaice (*Pleuronectes platessa*) in quantity, the feasibility of raising marine fish to marketable size in sheltered waters on the West Coast of Scotland and in the warm water discharge of electrical generating stations has been examined. Although

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

initially the two projects were considered independently, many of the techniques under development are common to both. Progress made in the last five years is described. It is suggested that the feasibility of raising fish to marketable size has been established and it is possible to identify many of the problems requiring investigation before a costed technology is available. Some problems involved are controlling water temperature, light intensity and bacteria during hatching, providing an adequate supply of a nutritionally balanced food of a size capable of being taken in by the larvae, and finding other species of fish which are tolerant to the hydrographic features of warm water discharges from power plants. (See also W73-04337) (Oleszkiewicz-Vanderbilt) W73-04339

MARICULTURE IN JAPAN USING HEATED EFFLUENT WATER, Miami Univ., Fla.

W. T. Yang.
In: Proceedings of Conference on the Beneficial Uses of Thermal Discharges, 17-18 September 1970. New York State Dept. of Environmental Conservation, Albany, N.Y., (1970), p 29-43, 6 fig, 13 ref.

Descriptors: *Agriculture, *Thermal pollution, *Fishing, *Heated water, *Statistics, Foods, Economics, Fish management, Fish farming, Fisheries, Aquatic habitats, Shrimp, Heat, Thermal powerplants, Temperature, Environmental effects, Water pollution, Powerplants, Fish hatcheries, Aquatic animals.
Identifiers: *Japan, *Waste heat, *Heat uses.

Japan is the world's largest fishing nation, with a total catch of approximately 8.6 million tons in 1969. Even though it maintains high landings from vessels, no other country is making as much effort in mariculture as Japan, because of the great importance of fish as a protein source. In 1967, Japan's total catch of 7.8 million tons, valued at nearly two billion U.S. dollars, included a mariculture production of 470,000 tons, valued at nearly 300 million U.S. dollars; this comprised 6% of the total catch and 15% of the total value. Japanese mariculture statistics for 1967 are reviewed, and a summary is given of activities in this field. A map is presented showing the distribution of Japanese power plants engaged in mariculture experiments using heated effluents. Shrimp and yellowtail (*Seriola* sp.) are the principal species cultured in programs using heated effluent waters. The life histories, larval culture, and general farming methods of the two species are described. *Seriola* grown in a 143 ton capacity tank with heated effluent water introduced in the winter to maintain the temperature at 20-24°C had 1.5 times the growth rate of those in ordinary culture conditions. (See also W73-04337) (Oleszkiewicz-Vanderbilt)
W73-04340

CATFISH FARMING - BENEFICIAL USE OF WASTE HEAT, Catfish Farmers of America, Laurel, Miss.

C. W. Pickering.
In: Proceedings of Conference on the Beneficial Uses of Thermal Discharges, 17-18 September 1970. New York State Dept. of Environmental Conservation, Albany, N.Y., (1970), p 46-50.

Descriptors: *Fish farming, *Heated water, *Catfishes, Foods, Economics, Fisheries, Fish management, Aquatic habitats, Heat, Thermal pollution, Thermal powerplants, Temperature, Environmental effects, Heated water, Water pollution, Powerplants, Fish hatcheries, Ponds, Aquaculture.
Identifiers: *Waste heat, *Heat uses.

Catfish farming is a relatively new industry. In 1960 only 200,000 lbs of catfish were produced. Today (1970) some 40-45,000 acres of farm lands

are devoted to catfish production. Estimated income is in excess of 20 million dollars and is expected to double in 1975. The process of raising catfish from spawning and hatching to grown individuals is described followed by a description of farming methods. Catfish are a remarkable converter of feed with a ratio of 1.3 lbs of feed to 1 lb of meat not being unusual. This conversion rate can be increased through increased water temperature. Three projects utilizing heat for catfish farming are briefly described: Colorado City, Texas at a plant operated by Texas Electric Service Company; Lake Hico near Jackson, Mississippi and a TVA plant near Gallatin, Tennessee. (See also W73-04337) (Oleszkiewicz-Vanderbilt)
W73-04341

BIOLOGICAL LIMITATIONS ON THE USE OF WASTE HEAT IN AQUACULTURE, Oak Ridge National Lab., Tenn.

C. C. Coutant.
In: Proceedings of Conference on the Beneficial Uses of Thermal Discharges, 17-18 September 1970. New York State Dept. of Environmental Conservation, Albany, N.Y., (1970) p 51-61, 7 fig, 15 ref.

Descriptors: *Aquaculture, *Aquatic animals, *Temperature, *Heated water, Foods, Growth rates, Biology, Heat, Thermal pollution, Thermal powerplants, Environmental effects, Water pollution, Powerplants, Heating, Cooling, Cooling towers, Carrying capacity.

Identifiers: *Biological limitations, *Heat uses, Biological responses, Food utilization, Acclimation, Waste heat.

Although warmer water generally stimulates growth of aquatic organisms, the easy availability of warmed power station coolant does not necessarily assure success of aquaculture. Certain biological limitations must be carefully considered, such as (1) the complex relationships among temperature, food utilization and growth, (2) metabolic and food waste products and their effects on the receiving water (compared to the effects of heat above), (3) uptake of radionuclides by cultured species (and acceptance as for human food), and (4) tolerances of organisms to biocides and temperature changes caused by variations in plant operation. Some of these biological limitations may inflict severe economic ones as well, and thus affect the feasibility of aquaculture projects. Assistance in planning can be obtained from established fields of salmon and trout culture, radioecology, and thermal ecology. (See also W73-04337) (Oleszkiewicz-Vanderbilt)
W73-04342

THE THERMAL-WATER HORTICULTURAL DEMONSTRATION PROJECT AT SPRINGFIELD, OREGON, Vitro Corp. of America, Portland, Oregon.

H. H. Miller, Jr.
In: Proceedings of Conference on the Beneficial Uses of Thermal Discharges, 17-18 September 1970. New York State Dept. of Environmental Conservation, Albany, N.Y., (1970), p 62-69, 3 photo.

Descriptors: *Horticulture, *Demonstration farms, *Irrigation, *Heated water, *Frost, *Oregon, *Cooling, Cooling towers, Lakes, Humidity, Agriculture, Horticultural crops, Orchards, Economics, Beneficial use, Soil, Soil moisture, Heat, Temperature, Environmental effects, Heating, Powerplants, Thermal pollution, Thermal powerplants.
Identifiers: *Heat uses, *Waste heat, Cooling lakes.

The Federal Water Quality Control Administration, Eugene Water and Electric Board, seven farmers and Vitro Corporation are conducting a thermal water demonstration project at Springfield,

Oregon. Utilization of thermal waters by agriculture is an effluent-cooling method that holds much promise. Such utilization treats thermal water as a resource to be used—not a waste product to be expensively dissipated. A 1,000 MW nuclear plant could, for example provide water to irrigate roughly 100,000 to 150,000 acres of otherwise arid and uncultivated land. Demonstration work on the project now centers on four programs: (1) Frost protection by sprinkler application, (2) Plant cooling, (3) Irrigation, (4) Economic benefits. The physical project involves monitoring, alarm and valve equipment that allow farmers to have full control in the utilization of rejected heat from the nearby thermal powerplant. (See also W73-04337) (Oleszkiewicz-Vanderbilt)
W73-04343

WASTE HEAT USE IN CONTROLLED-ENVIRONMENT GREENHOUSES, Arizona Univ., Tucson.

C. N. Hodges, M. H. Jensen, and C. O. Hodge.
In: Proceedings of Conference on the Beneficial Uses of Thermal Discharges, 17-18 September 1970. New York State Dept. of Environmental Conservation, Albany, N.Y., (1970), p 108-116, 4 tab, 11 ref.

Descriptors: *Greenhouses, *Horticulture, *Heated water, *Deserts, Humidity, Arizona, Crops, Soils, Irrigation, Heat, Thermal pollution, Thermal powerplants, Temperature, Environmental effects, Water pollution, Powerplants, Heating, Cooling water, Beneficial use.
Identifiers: *Waste heat, *Diesel electric generators, Blowdown water.

Waste heat from diesel electric generator sets is utilized to desalt seawater. Crops within controlled-environment greenhouses then are irrigated with the fresh water. Although blowdown water from the desalting system could be used to heat the structures during the winter, this has not been necessary, thus far, in the hot areas where the experiments are conducted. There are two reasons for controlled-environment horticulture: to reduce the quantity of water required (i.e., if high humidity is maintained, plants transpire less), and to grow vegetables where external conditions are harsh. Nineteen kinds of vegetables have been harvested from such greenhouses in Puerto Penasco, Sonora, Mexico, and now a larger scale complex is being built in the Middle East at Abu Dhabi. The total concept of power/water/food facilities would seem to be most applicable to desert coasts. Some aspects of the idea should be useful elsewhere, however. (See also W73-04337) (Oleszkiewicz-Vanderbilt)
W73-04345

AN INDEPENDENT VIEW OF THE USE OF THERMAL POWER STATION COOLING WATER TO SUPPLEMENT INTER-REGIONAL WATER SUPPLY, Battelle-Pacific Northwest Labs., Richland, Wash.

R. T. Jaske, and C. J. Touhill.
In: Proceedings of Conference on Beneficial Uses of Thermal Discharges, 17-18 September 1970. New York State Dept. of Environmental Conservation, Albany, N.Y., (1970), p 117-131, 3 fig, 3 tab, 12 ref.

Descriptors: *Pacific Northwest U.S., *Heated water, *Water supply, *Cooling, Recreation, Nuclear powerplants, Oregon, Water quality, Water utilization, Heat transfer, Heat, Thermal pollution, Thermal powerplants, Temperature, Environmental effects, Powerplants, Water pollution, Surface waters, City planning.
Identifiers: *Waste heat, *Thermal discharges, *Canal-lake cooling system.

Much research is under way on the direct utilization of thermally warmed water from large power

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

stations. Because of the size of these installations, agricultural implementation is involved in public policy from the onset of planning. As a result, delays in construction can be predicted because of the nature of the appropriation process. In addition, studies of large thermal stimulation systems have so far failed to demonstrate financial feasibility for systems growing anything but specialty crops such as fruits. Compared to the total amount of heat which is potentially available, the amount which could be used for agricultural stimulation is relatively small and the energy is still released into the atmosphere to be a potential problem in the development of micro-climates. As an alternative, the use of canals is suggested for the redistribution of water resources as part of the long range goals of a national policy which would permit advance planning of means to redirect metropolitan growth. This development would permit implementation of programs to create new, self-supporting metropolitan centers where present resources distribution precludes such development naturally. Such a development would take the form of multi-purpose reclamation which has as its principal object the creation of a balanced metropolitan, industrial and recreational environment. (See also W73-04337) (Oleszkiewicz-Vanderbilt) W73-04346

PROBLEMS AND OPPORTUNITIES IN WASTE HEAT DISPOSAL, New York State Public Service Commission, Albany.

J. C. Swidler.

In: Proceedings of Conference on Beneficial Uses of Thermal Discharges, 17-18 September 1970. New York State Dept. of Environmental Conservation, Albany, N.Y., (1970), p 132-138.

Descriptors: *New York, *Heat, *Heated water, *Thermal powerplants, Nuclear powerplants, Electrical power demand, Electric power production, Temperature, Environmental effects, Thermal pollution, Water pollution, Powerplants, Heating, Cooling, Breeder reactors, Beneficial use. Identifiers: *Waste heat, *Gas turbines, *Thermal discharges, Magneto hydrodynamics, Electrogasdynamics, Exhaust heat, Heat assimilation capacity, Residual heat.

The problem of continuous heat buildup in a localized area is introduced with the example of New York State which provides almost one-tenth of the production goods in the national economy of the United States, using approximately 5% of the entire nation's power demand. One of the best possible uses of waste heat is for more power generation, preferably in a configuration which exhausts the residual heat directly into the atmosphere. Several systems based on this principle are briefly described. The gas turbine may well be a prototype for major generating stations which recycle waste heat and which do not require water for purposes of heat transfer. One of the most promising developments in the gas turbine field is that of the 'combined cycle' unit, which utilizes the exhaust heat produced by the gas turbine to operate a conventional steam turbine. Other systems such as breeder reactors, fuel cells, magnetohydrodynamics (MHD) and electrogasdynamics (EGD) are also described. Both our natural resources as well as heat assimilation capacity are far from unlimited. (See also W73-04337) (Oleszkiewicz-Vanderbilt) W73-04347

BENEFICIAL USE OF HEAT IN ICELAND, TECHNICAL AND ECONOMICAL ASPECTS AND FUTURE PROSPECTS, M. Matthiasson.

In: Proceedings of Conference on Beneficial Uses of Thermal Discharges, 17-18 September 1970. New York State Dept. of Environmental Conservation, Albany, N.Y., (1970), p 139-184, 20 fig, 19 ref.

Descriptors: *Geothermal studies, *Greenhouses, *Heated water, *Economics, Geology, Climates, Water chemistry, Farms, Heating, Heat, Electric power demand, Electric power production, Heavy water, Desalination plants, Thermal powerplants, Beneficial use. Identifiers: *Heat use, *Geothermal powerplants, *Iceland, *Geothermal energy, Thermal energy.

The use of geothermal energy has more than doubled in the last decade and is expected to do so during the next. The heat energy utilized in Iceland during 1970 is 8.8 trillion BTU/year. It is mainly used for district heating for 80,000 people or 40% of the population and for greenhouse farming of 115,000 m² under glass. The cost for district heating is \$1/million BTU and for greenhouses is \$0.11/million BTU. Other waste heat outlets are industrial users, mainly the Diatomic Earth Plant at a cost of \$0.15/million BTU and electric power production, where a 3.5 MW turbine is operated on geothermal steam at a generating cost of 2.9 mill/kWh. Among future prospects are the production of chemicals from brine and seawater; and heavy water production of estimated 400 metric tons/year at an expected price of \$16.7/lb. It is estimated that the potential of thermal energy resources is 280 trillion BTU/year. (See also W73-04337) (Oleszkiewicz-Vanderbilt) W73-04348

AGRICULTURAL AND URBAN USES OF LOW-TEMPERATURE HEAT, Oak Ridge National Lab., Tenn.

S. E. Beall, Jr.

In: Proceedings of Conference on Beneficial Uses of Thermal Discharges, 17-18 September 1970. New York Dept. of Environmental Conservation, Albany, N.Y., (1970), p 185-201, 6 fig, 3 tab, 4 ref.

Descriptors: *Heated water, *Heat, *Thermal powerplants, *Agriculture, *Irrigation, Condensers, Poultry, Vegetable crops, Greenhouses, Nuclear reactors, Turbines, Steam turbines, Steam, Cooling, Desalination plants, Water uses, Thermal pollution, Temperature, Environmental effects, Powerplants, Heating, Water pollution, Beneficial use, Colorado. Identifiers: *Waste heat, *Gas turbines, *Thermal discharges, Magneto hydrodynamics, Electrogasdynamics, Exhaust heat, Heat assimilation capacity, Residual heat.

The warm water normally discharged from the condensers of steam electric generating stations is a valuable source of heat for agricultural operations which can be conducted near the station. Such operations include year-round vegetable growing, broiler and egg production, and swine husbandry in controlled-environment structures. A system of direct heat exchange is believed applicable for maintaining the temperature and humidity of these structures near the optimum growth range for many plants, poultry and swine. A study of these applications for a 300 Mwe Gas-cooled Reactor is described. It is shown that the station cooling tower could be replaced by 200 acres of greenhouses, etc. By backpressuring the turbine exhaust slightly, 100 degrees to 120 degrees F, the resultant exhaust steam is an economical source of heat for desalting water. The heat from a 1000-Mwe station can produce 25 to 30 million gallons of water per day for irrigation or municipal consumption. Results of a recent study of several urban applications for heat available at higher backpressures are presented. (See also W73-04337) (Oleszkiewicz-Vanderbilt) W73-04349

COMBINATION URBAN-POWER SYSTEMS UTILIZING WASTE HEAT, Westinghouse Electric Corp., Pittsburgh, Pa.

R. A. Bell, W. J. Cahill, A. S. Cheifetz, G. T. Cowherd, and J. A. Nutant, Jr.

In: Proceedings of Conference on Beneficial Uses of Thermal Discharges, 17-18 September 1970. New York Dept. of Environmental Conservation, Albany, N.Y., (1970), p 202-213, 8 fig.

Descriptors: *Heat, *Heated water, *Condensers, *Air conditioning, Waste water treatment, Fog, Greenhouses, Cooling, Heating, Thermal pollution, Temperature, Environmental effects, Thermal powerplants, Water pollution, Powerplants, Beneficial use, Dispersion.

Identifiers: *Waste heat, *Thermal discharges, Fog dispersal, De-icing, Thermophilic stabilization.

Seven different waste heat utilization schemes are presented. Heat could be used to increase the capacity and efficiency of sewage treatment processes. Second is the process of thermophilic stabilization of wastewater effluents, based on existing results of a pilot plant study. Airport fog dispersal systems, accounting for further heat dissipation, coupled with airport de-icing are two more schemes. Greenhouses are another possible source of waste heat utilization. All of the above systems have been critically analyzed and rejected by the Task Force of Consolidated Edison and Westinghouse. The only two recommended systems are condenser discharge aeration and space heating and air conditioning. No decision has yet been made as to the practical feasibility of either or both systems for specific applications. (See also W73-04337) (Oleszkiewicz-Vanderbilt) W73-04350

BENEFICIAL USES OF WASTE HEAT - AN EVALUATION, Pacific Northwest Water Lab., Corvallis, Ore.

R. R. Garton, and A. G. Christianson.

In: Proceedings of the Conference on Beneficial Uses of Thermal Discharges, 17-18 September 1970. New York Dept. of Environmental Conservation, Albany, N.Y., (1970), p 214-220, 8 ref.

Descriptors: *Heated water, *Heat, *Water uses, Agriculture, Horticulture, Fish farming, Cooling, Heating, Air conditioning, Economics, Cost-benefit analysis, Legislation, Waste water treatment, Temperature, Thermal pollution, Thermal powerplants, Water pollution, Powerplants, Greenhouses, Heating, Beneficial use, Aquaculture. Identifiers: *Waste heat, *Heat uses.

There are a number of proposed beneficial uses of the waste heat contained in power plant cooling water. Included are those for which the technical feasibility has been demonstrated in pilot programs and those which are, at best, imaginative ideas. Seen from the standpoint of a regulatory agency, a beneficial use must help reduce the thermal pollution problem directly or it must provide a profit to help offset the cost of cooling devices. Furthermore, the use must not result in additional pollution such as that resulting from untreated organic wastes. Some uses, such as the culture of certain fishes, are now at the pilot program, or even commercial, stage. Other uses, such as for industrial processes, require additional research. Integrated systems planned to produce steam as well as electrical power have been successful in special situations. In nearly all cases additional information on the overall economics of the proposed methods is needed. This is especially true where high quality heat is taken directly from the power plant steam cycle for another use. Only with a complete economic analysis, including cost of distribution, waste treatment, etc., can a final decision be made as to whether a beneficial use is truly beneficial in the long run. (See also W73-04337) (Oleszkiewicz-Vanderbilt) W73-04351

EROSION SEDIMENT PRODUCTION, Kentucky Univ., Lexington. Dept. of Agricultural Engineering.

For primary bibliographic entry see Field 02J.
W73-04358

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

WATER POLLUTION CONTROL IN PULP AND PAPER INDUSTRY.
Crown Zellerbach Corp., San Francisco, Calif.
For primary bibliographic entry see Field 05D.
W73-04424

EFFLUENT STANDARDS AND WATER REUSE,
Essex River Authority (England).
For primary bibliographic entry see Field 05D.
W73-04425

EUROPE'S MAJESTIC SEWER,
J. Tinker.
New Scientist, Vol 56, No 817, p 194-199, October 1972.

Descriptors: *Water quality, *Water pollution, *Water pollution effects, Water pollution control, Water pollution sources, Water pollution treatment, Oxygen demand, Industrial wastes, Oil spills, Thermal pollution, Potash.
Identifiers: *Rhine River.

The Rhine is heavily polluted over most of the 1200 kilometers from the glaciers of the Swiss alps down to the dykes of the Netherlands. The river is no longer holding its own. The oxygen content of both the upper and lower Rhine is declining and the biochemical oxygen demand (BOD) is rising. Pollution problems on the Rhine include dumping of untreated municipal and industrial wastes, oil spills from barges, thermal pollution from nuclear and conventional power plants, and salt pollution from French potash mines in Alsace. The International Commission for the Protection of the Rhine Against Pollution, begun in 1950, has no power to act. It can only recommend action on its own member governments, and even its recommendations are often tied up due to lack of international unanimity. (Murphy-Texas)
W73-04428

ANALYTICAL TECHNIQUE MAY CUT OIL SPILLS,
Adcon Corp., Santa Barbara, Calif.
G. E. Ingram, and P. A. Dec.
The Oil and Gas Journal, Vol 70, No 45, p 75-76, November 1972, 4 fig.

Descriptors: *Analytical techniques, *Reliability, *Oil spills, Statistical methods, Maintenance costs, Operation costs, Systems analysis, Water pollution control.
Identifiers: *Probability, Oil production.

Increased oil productivity and reduced oil spill risks may result from the application of an analytical technique that combines probability and statistical theory. The basic concepts used are essentially those applied to reliability analysis in the aerospace industry. The method is illustrated for the design of a subsea completion system. Four curves are constructed for this purpose. The first three graph reliability level versus reliability cost, penalty cost, and maintenance and operation costs respectively. The fourth curve represents the sum of the first three, and thus shows the total system costs for different levels of reliability. The lowest point of this curve gives the minimum cost point, beyond which further investment in reliability is no longer beneficial. (Murphy-Texas)
W73-04429

SEWER SERVICE GAMBLE WORTH \$120,000,
C. Smith.
Public Works, Vol 103, No 10, p 83-85, October 1972, 2 fig.

Descriptors: *Sewers, *Cleaning, *Interceptor sewers, Pipes, Waste water, Storm runoff, Iowa.
Identifiers: *Clogged pipelines, *Davenport (Iowa).

A complete account is given of how Ace Pipe Cleaning, Inc., Kansas City, Missouri, a specialized sewer cleaning service, helped the City of Davenport, Iowa solve a 3 year old problem of a plugged pipe line. Unable to find the cause of the clogged pipeline, engineers had decided to install a new line 310 feet long for a cost of \$150,000. Ace Pipe Cleaning, Inc., offered to locate the problem and clean the pipeline, saving \$120,000 for the city. The reasons for the problem, the cleaning operations undertaken, the use of specialized devices by the service company etc., have been detailed. (Morparis-Texas)
W73-04434

CLEAN WATER AND POWER,
Sacramento State Coll., Calif.
C. A. Washburn.
Environment, Vol 14, No 7, p 40-44, September 1972, 4 tab.

Descriptors: *Electric power demand, *Electric power costs, *Waste water treatment, *Treatment facilities, Water pollution control, Power plants, Growth rates, Tertiary treatment.

Because of the well-known environmental consequences of electrical production and distribution, a question arises as to whether the pollution caused by the power requirements of water pollution control programs will approach or outweigh the benefits gained. A power increase of 2.9% would suffice to furnish secondary and tertiary treatment to every remaining untreated effluent in the United States. Even producing the pristinely pure effluent of the Lake Tahoe plant represents only a 3.3 percent addition over tertiary power needs. This compares to a past overall power growth rate of 7 percent per year. Power growth demands are not attributable to waste water treatment needs, nor can secondary pollution from power demands be used as an excuse for halting pollution control efforts. (Anderson-Texas)
W73-04436

THE CASE FOR HIGHER RATE WASTE WATER TREATMENT,
Black and Veatch, Kansas City, Mo.
For primary bibliographic entry see Field 05D.
W73-04445

RIVER BASIN MONETARY AUTHORIZATIONS-1969, CHESAPEAKE BAY BASIN IN COMPREHENSIVE STUDY.
For primary bibliographic entry see Field 06E.
W73-04454

THE 92ND CONGRESS-GOOD AND BAD.
For primary bibliographic entry see Field 06E.
W73-04456

THE EXPANSION OF FEDERAL COMMON LAW AND FEDERAL QUESTION JURISDICTION TO INTERSTATE POLLUTION,
S. B. O'Connor.
Houston Law Review, Vol 10, p 121-130, 1972. 82 ref.

Descriptors: *Water pollution control, *Federal jurisdiction, *Judicial decisions, *Pollution abatement, Legal aspects, Water law, Regulation, Economic benefits, Industrial wastes, Interstate, Constitutional law, Federal Water Pollution Control Act, Watercourses (Legal aspects), Interstate rivers, Lake Michigan.

Locally the economic benefits of an activity that generates pollution may outweigh its detriment to the immediate environment. Because pollution, however, seldom remains wholly within the locale where it originates, the public in states far removed from the local benefits of pollution

generating activities may attempt to force their abatement as public nuisances. The inherent unfairness in allowing one state to enforce its law against an activity in a sister state makes a federal forum for pollution complaints necessary. In answering this need the Supreme Court has authorized United States district courts to hear suits for the abatement of interstate air and water pollution, basing jurisdiction of the district courts on the existence of federal common law. The opinion in the case, Illinois v. City of Milwaukee (1972), extends to interstate pollution problems the federal common law that has evolved in areas where federal judicial action was not foreclosed. It opens the federal district courts to federal common law abatement actions based on public nuisance, thereby permitting development of a uniform body of pollution control law. (Tolle-Florida)
W73-04461

NON-POINT SOURCE POLLUTION FROM AGRICULTURAL, RURAL, AND DEVELOPING AREAS.

For primary bibliographic entry see Field 05B.
W73-04462

EDEN PRESERVED,
H. E. Albert.
May 1, 1972, 16 p, 3 ref. OWRR-B-034-SC (4).

Descriptors: *Environmental effects, *Water pollution sources, *Oil pollution, *Social participation, Water pollution, Oil industry, Industrial plants, Industrial wastes, South Carolina, Air pollution, Water quality, Judicial decisions, Public rights, Effluents, Population, Social aspects, Chemical industry, Social values, Social impact, Governmental interrelations.
Identifiers: Private interest groups.

South Carolina authorities, in October of 1969, announced that Badische Anilin and Soda Fabrik (BASF) would build a chemical plant in Beaufort County. It later became apparent that the plant was to be a petro-chemical facility. Responses of the neighboring populace to what they considered to be a threat to their environment are discussed. Three basic courses were followed: (1) an intensive publicity campaign, (2) intensive activity at the national governmental level, and (3) use of the courts to delay schedules. State officials were unprepared for this effective opposition and conducted a counter-campaign which left hostility toward, and distrust of, government among significant segments of the private sector. The purposes of reconstructing the events are to discover: (1) the points of friction between the private sector and various levels of government, (2) intergovernmental and interagency relations, (3) inherent group methods of obtaining support and (4) the areas where a breakdown of communication occurred between the various interested parties. (Reed-Florida)
W73-04466

CONTROL OF COPPER ELECTROPLATING WASTES: AN ANNOTATED BIBLIOGRAPHY,
Vermont Univ., Burlington. Technical Information Center.

W. T. Emery.

Available from the National Technical Information Service as PB-210 309, \$3.00 in paper copy, \$0.95 in microfiche. June 15, 1972. 6 p, 17 ref.

Descriptors: *Copper compounds, *Water chemistry, *Information retrieval, *Water pollution sources, *Bibliographies, Water quality, Water treatment, Waste water (Pollution), Industrial wastes, Acidic water, Copper, Surveys, Chemicals, Chemical engineering, Metals, Mineral water, Water quality control.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 05

Water Quality Control—Group 5G

During the period in which this bibliography was compiled, the regulations of the state of Vermont governing water classification and water quality control stated in part that there shall be no discharge of industrial or commercial process waste containing copper in excess of 0.2 milligrams per liter. The requirement to meet this difficult water pollution control standard prompted a survey of the published literature from late 1971 through early 1972 to ascertain the state-of-the-art in regard to controlling water-borne copper wastes with emphasis on electroplating processes. This annotated bibliography prepared from pertinent material gathered during the survey includes seventeen articles and is compiled alphabetically by author. (Tolle-Florida)
W73-04467

CONSTRUCTION OF WASTEWATER FACILITIES, RED OAK, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Dallas, Tex. Air and Water Programs Div.

Available from the National Technical Information Service as EIS-TX-72-4680-F, \$8.75 in paper copy, \$0.95 in microfiche. May 26, 1971. 121 p, 3 fig, 2 map, 5 tab, 3 chart.

Descriptors: *Environmental effects, *Treatment facilities, *Waste water treatment, *Texas, *Waste water disposal, Federal Water Pollution Control Act, Federal government, Discharge (Water), Effluents, Water pollution, Project planning, Grants, Government supports, Government finance, Project benefits, Public health, Irrigation, Aesthetics, Municipal wastes, Sanitary engineering, Sewage effluents, Sewerage. Identifiers: *Environmental Impact Statements, *Red Oak (Tex).

The City of Red Oak, Ellis County, Texas, has applied for federal funds to aid in constructing a complete wastewater treatment system. The total project includes all facilities necessary for the collection, transportation, and treatment of wastewater generated in the city. Discharge of the treated effluent will be to an unnamed tributary of Red Oak Creek. The project is designed to eliminate the septic tanks that are presently contributing to pollution of surface water and creating potential health hazards in the area. Alternatives considered included: (1) grant rejection—the proposed project might be financed without federal grant aid; (2) provide advanced waste treatment facilities to supplement effective secondary treatment; (3) construct an interceptor to transport waste water; (4) total retention ponds large enough to preclude effluent discharge to a receiving stream; (5) irrigate a privately owned golf course with the treated effluent, precluding discharge to a receiving stream; (6) hauling raw waste by truck to a regional treatment facility; (7) discharge of treated effluent to a receiving stream with lesser aesthetic value; and (8) no action. Listed are federal, state, and local agencies from which comments have been solicited. (Tolle-Florida)
W73-04468

CONFERENCE IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE MERRIMACK AND NASHUA RIVERS AND THEIR TRIBUTARIES, MASSACHUSETTS-NEW HAMPSHIRE AND THE INTRASTATE PORTIONS OF THOSE WATERS WITHIN THE STATE OF MASSACHUSETTS.
Federal Water Pollution Control Administration, Washington, D.C.

Proceedings of the Second Session (Reconvened in Workshop Sessions) of Conference in the Matter of Pollution of the Waters of the Merrimack and Nashua Rivers and their Tributaries, October 20-21, 1970, Bedford, New Hampshire. 268 p, 5 map, 2 chart, Vol 1 (1970).

Descriptors: *Interstate commissions, *Water pollution control, *Interstate rivers, *New Hampshire, *Massachusetts, Navigable rivers, Federal Water Pollution Control Act, Legislation, Federal government, Recreation, State governments, Local governments, Water quality control, Governmental interrelations, Fish conservation, Water treatment.

Workshop sessions for a conference relating to pollution of the waters of the Merrimack and Nashua Rivers and their tributaries in the States of New Hampshire and Massachusetts are described. The first session of this Conference was initiated in 1964 in accordance with a request from the Governor of Massachusetts, and on the basis of reports, surveys, and studies under the provisions of the Federal Water Pollution Control Act. The purpose of the Conference is to bring together the state and interstate water pollution control agencies, representatives of the U.S. Department of the interior, and other interested parties to review the existing situation and the progress which has been made to comply with the Conference recommendations; to lay a basis for future action by all parties concerned; and to give the states, localities, and industries an opportunity to take any indicated remedial action under state and local law. Eleven statements are included. (Tolle-Florida)
W73-04469

ENVIRONMENTAL DEFENSE FUND, INC. V. CORPS OF ENGINEERS OF THE UNITED STATES ARMY (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT).
For primary bibliographic entry see Field 06E.
W73-04471

FORMER CAMP PARKS SEWAGE DISPOSAL PLANT, PARCEL A-2 PLEASANTON, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
General Services Administration, Washington, D.C.

Available from the National Technical Information Service as EIS-CA-72-4919-F, \$3.00 in paper copy, \$0.95 in microfiche. July 20, 1972, 20 p, 1 fig.

Descriptors: *Sewage disposal, *Environmental effects, *Sewage lagoons, *Water quality control, *California, Disposal, Waste disposal, Sewage, Sewage districts, State governments, Sewage effluents, Wastes, Sewage treatment, Treatment facilities. Identifiers: *Environmental Impact Statements, *Pleasanton (Calif).

The project involves the interim use for holding treated effluent of a parcel of land that is a portion of Camp Parks located in Pleasanton, California. The land was owned by the federal government and had been used as a sewage disposal area by the military. When this use discontinued the federal government made plans to transfer it to a California county that proposed to construct a reclamation facility on the property. In the interim another agency had urgent need of the property as an effluent holding area to contain flows in excess of its sewage treatment capacity. Environmental factors that were assessed were construction noise, dust and traffic; odor emissions; insect nuisance; leakage leading to ground water contamination and salinity increase. No long term effects were expected. The need for immediate use of the ponds militated against two alternatives considered. (Nielsen-Florida)
W73-04474

A METHOD FOR MINIMIZING EFFECTS OF WASTE HEAT DISCHARGES,
Baltimore Gas and Electric Co., Md.
F. J. Jeffers.
International Journal of Environmental Studies, Vol 3, No 4, p 321-327, 1972. 3 fig.

Descriptors: *Estuaries, *Thermal pollution, *Nuclear power plants, Model studies, Cooling waters, Waste disposal, Water quality, Design criteria, *Chesapeake Bay.

An investigation was made to develop the means for minimizing the environmental effects of the once-through method of power plant condenser cooling. The information for the design of the system was gathered by studying four general areas: (1) the adequacy of the heat assimilative capacity of the estuary in the vicinity of the plant site, (2) the physical characteristics of the estuary with particular regard to current flow patterns and development of temperature, salinity and dissolved oxygen profiles, (3) design criteria for the protection of the marine ecology, and (4) predictions by analytic methods or hydraulic model studies of the distribution of excess temperatures in the receiving waters caused by the cooling water discharges. The application of this approach was illustrated by its use in the design of the two-unit Calvert Cliffs Nuclear Power Plant being constructed on the Chesapeake Bay in Maryland. (Murphy-Texas)
W73-04481

THE CLIVUS TOILET - SANITATION WITHOUT POLLUTION,
L. D. Hills.
Compost Science, Vol 13, No 3, p 8-11, May-June 1972. 7 fig, 1 tab.

Descriptors: *Waste disposal, *Waste treatment, Fertilizers, Potash, Domestic wastes, Sewage, Sewage disposal, Economics, Public health. Identifiers: *Sanitation system, *Clivus toilet, *Toilets.

Experiments by Rikart Lindstrom have led to the development of a safe and odorless sanitation system. This waterless toilet system, called a Clivus, is fitted with a compost box that slopes down to keep the contents slowly sliding from the fresh deposits at the top to the dry, composted material in the collecting chamber. The combined toilet and kitchen wastes for a family of three adults reduces to approximately 100 pounds of high potash fertilizer. This processing eliminates pathogens and meets the approval of the Public Health Authorities in both Sweden and Norway. Lindstrom and his son Carl have also been experimenting with a vacuum sewage system, called Sanivac, that uses about 75% less water than normal sanitation. Combining Sanivac toilets with the Clivus composting system could develop a sewage system for the future. (Murphy-Texas)
W73-04482

CORPORATE CHECKPOINTS TO POLLUTION CONTROL,
Atlantic Richfield Co., Philadelphia, Pa.
W. B. Halladay.
Industrial Water Engineering, Vol 6, No 12, p 25-27, December, 1969.

Descriptors: Conservation, *Waste treatment, Preservation, *Industrial wastes, *Water quality standards, *Water pollution control, Water pollution sources, Effluents. Identifiers: Pollution control, *Public relations, Natural resources.

Environmental (pollution) control is one of the largest public and industrial concerns. Industry is often blamed as the cause of pollution by the public. Much of the responsibility does lie with industry. General considerations and philosophies which may be tailored for specific situations are: (1) recognition that pollution exists and that the company facilities contribute to it if necessary; (2) a company policy concerning pollution control must be formulated and spread to all employees; (3) evaluate costs involved to meet legislation now and to meet future industrial needs; (4) certain individuals should be designated to assume responsi-

Field 05—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

bility for conservation activities; (5) knowledge of legislative matters concerning environmental control must be accumulated continuously on all levels of government; (6) represent your company at public hearings and testify in lay language; (7) consider time involved to complete new waste treatment facilities in accordance with the law; (8) support the public relations function and communicate honestly with the public; (9) inform employees of the companies conservation efforts and notify them of their individual responsibilities; (10) encourage employees to work with non-industrial groups on the problems; (11) assume leadership in community projects to control pollution; and (12) organize a company-wide effort at all levels from administrative to and including public relations. (Gottschalk-Texas)
W73-04483

EFFLUENT STANDARDS AS PROPOSED BY THE ROYAL COMMISSION ON SEWAGE DISPOSAL,
Ouse and Hull River Authority, Leeds (England).
M. Lovett.
Water Pollution Control, Vol 68, Part 3, p 276-282,
1969. 1 tab, 9 ref.

Descriptors: *Sewage disposal, *Municipal wastes, *Industrial wastes, Waste disposal, *Water quality standards, Water pollution, Standards, Waste dilution.
Identifiers: *Effluent standards.

The Royal Commission, inquiring and reporting on sewage treatment methods since 1898, developed effluent standards for municipal wastes (1912) and industrial wastes (1915). Though based on incomplete information, these standards remain remarkably useful today, and the work of the commission is held to be a landmark. The assumptions used in establishing the standards control their strengths and weaknesses, but most advocates of stricter standards must contend with the fact that even these standards are not being currently met. Standards for trade effluents were not as finely developed as those for municipal sewage, the commission even then recognizing a need for more research. (Anderson-Texas)
W73-04491

EFFLUENT STANDARDS FROM THE VIEW-POINT OF THE INDUSTRIALIST;
Effluent Control Ltd., Birmingham (England).
G. Mattcock.
Water Pollution Control, Vol 68, Part 3, p 339-346,
1969. 3 fig, 2 tab, 7 ref.

Descriptors: *Standards, *Industrial wastes, Analysis, Waste water treatment, Effluents, Regulation, Monitoring, Water quality standards.
Identifiers: *Great Britain, Effluent standards.

Standards imposed on industries must be capable of precise definition, subject to reliable analysis, appropriately strict or lenient, possible to attain by reasonable means, and relevant to the specific situation. Different standards require different treatment schemes, some of which are practical for only the largest industries. Effluent charges and discharge limits can be incorrectly formulated, thus penalizing the industrialist unnecessarily. It may be that smaller authorities have insufficient staffs to conduct a proper analysis of effluents, but the responsibility clearly lies on their shoulders to set accurate limits and conduct accurate monitoring. An extensive round-table discussion follows the conclusion. (Anderson-Texas)
W73-04493

EFFLUENT STANDARDS AND THE ASSESSMENT OF THE EFFECTS OF POLLUTION ON RIVERS,
Water Pollution Research Lab., Stevenage (England).
A. L. Downing, and R. W. Edwards.

Water Pollution Control, Vol 68, Part 3, p 283-299,
1969. 8 fig, 1 tab, 9 ref.

Descriptors: *Effluent streams, *Monitoring, Oxidation, Nitrification, Oxygen demand, Hardness (Water), Standards, Cost analysis, Waste water treatment, Water quality standards, Hydrogen ion concentration.

Identifiers: *Effluent standards.

BOD tests are used for effluent monitoring and calculating the effect of effluents in natural waters. Effluent monitoring is more straightforward, but still subject to misinterpretation. In predicting receiving water effects from BOD data, several factors must be accounted for, including oxidation rate characteristics, nitrification, adaptation of seed, and ultimate oxygen demand. Methods are suggested which give a better indication of an effluent's ultimate effect on a receiving stream. The formation of deposits are more difficult to predict, but methods are available to predict their consumption once formed. In establishing standards, a detailed knowledge of the specific situation is essential, as no current method applies generally. Other water criteria such as pH and hardness should be considered, particularly near fisheries. In all cases, standards should be based on a cost-risk evaluation. (Anderson-Texas)
W73-04494

RATIONAL PROCESS DESIGN STANDARDS FOR AEROBIC OXIDATION PONDS IN AHMEDABAD, INDIA,
Central Public Health Engineering Research Inst., Ahmedabad (India). Field Centre.
For primary bibliographic entry see Field 05D.
W73-04496

CONTROL OF GROWTH RATE BY INITIAL SUBSTRATE CONCENTRATION AT VALUES BELOW MAXIMUM RATE,
Oklahoma State Univ., Stillwater. School of Civil Engineering.
For primary bibliographic entry see Field 05C.
W73-04499

SEDIMENTATION—ANNOTATED BIBLIOGRAPHY OF FOREIGN LITERATURE FOR 1969 AND 1970, SURVEY NO 7.
For primary bibliographic entry see Field 02J.
W73-04507

EVALUATION OF SIZE OF ORGANIC SUBSTANCE LOSSES DURING STEAMING OF NATURAL WATERS (IN RUSSIAN),
Akademika Nauk SSSR, Moscow. Institut Biologii Vnutrennykh Vod.
B. A. Skopintsev, and A. G. Bakulina.
Gidrobiol Zh, Vol 7, No 6, p 13-18, 1971, English summary.

Identifiers: Losses, Organic substances, Size, *Steaming, Water pollution control.

Samples of natural waters of different origin were steamed at 60 deg and with addition of neutralizing acid, the relative losses of organic matter were different from 0 to 40% of its total quantity (by C). The greatest losses are typical for waters of basins with considerable biological productivity and for underground waters. The losses of organic matter are greater if the water is steamed with air flow. Content of organic matter in thawed snow amounts to about 10% of its amount in water. In distilled water of different degrees of purification, there may be a considerable amount of organic matter volatilized during steaming.—Copyright 1972, Biological Abstracts, Inc.
W73-04521

STREAM FAUNAL RECOVERY AFTER MAN-GANANE STRIP MINE RECLAMATION,
Virginia Polytechnic Inst. and State Univ., Blacksburg.

For primary bibliographic entry see Field 05C.
W73-04546

06. WATER RESOURCES PLANNING

6A. Techniques of Planning

REGIONAL DEVELOPMENT OF PUBLIC WATER SUPPLY SYSTEMS,
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 03D.
W73-04064

STOCHASTIC STRUCTURE OF WATER USE TIME SERIES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 04A.
W73-04098

COMBINED USE OF OPTIMIZATION AND SIMULATION MODELS IN RIVER BASIN PLANNING,
John F. Kennedy School of Government, Cambridge, Mass.
H. D. Jacoby, and D. P. Loucks.
Water Resources Research, Vol 8, No 6, p 1401-1414, December, 1972. 3 fig, 27 equ, 15 ref.

Descriptors: *Optimization, *Simulation analysis, *River basins, *Planning, *Computer programs, *Delaware River, Digital computers, Alternative planning, Mathematical models, Systems analysis.

Simulation models have proved to be extremely useful in aiding river basin planning. However, all suffer a common difficulty, since the analyst himself must formulate the physical design to be studied in each computer run. If the basin is large and offers a variety of development opportunities, the number of alternative system plans from which he must choose can be extremely large. An investigation is reported of the use of analytical optimization models to 'screen' the set of possible plans and to select a small number worthy of simulation analysis. Deterministic and stochastic optimization models have been developed and applied to both static and dynamic (multi-period) planning problems; the Delaware River basin is used as an example. The resulting designs have been analyzed by using a large-scale digital simulation model of the basin so that the ability of the screening models to identify high-valued alternatives can be evaluated. In this context the results indicate considerable promise for the combined use of optimization and simulation models. (Bell-Cornell)
W73-04275

OPPORTUNITY COSTS OF A TRANSBASIN DIVERSION OF WATER I. METHODOLOGY,
Hawaii Univ., Honolulu. Dept. of Economics; and Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W73-04276

INTEGRATION OF THE AGRICULTURAL DEMAND FUNCTION FOR WATER AND THE HYDROLOGIC MODEL OF THE FECOS BASIN,
New Mexico Univ., Albuquerque. Dept. of Economics.
For primary bibliographic entry see Field 06D.
W73-04277

FLEXIBLE PRICING IN WATER SUPPLY PLANNING—FOR FLEXIBLE ENGINEERS,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
M. Gysi.

WATER RESOURCES PLANNING—Field 06
Cost Allocation, Cost Sharing, Pricing/Repayment—Group 6C

Water Resources Bulletin, Vol 8, No 5, p 957-964, October 1972. 5 fig, 12 ref. OWRR A-023-NEB (2).

Descriptors: *Prices, *Water supply, *Reservoirs, *Simulation analysis, Digital computers, *Water rates, *Risks, Water users, Water shortages, Storage capacity, Mathematical models, Systems analysis.

Identifiers: Stochastic hydrology.

Preliminary results are presented from the use of a digital simulation model designed to test time-varying water pricing policies. Stochastic inflows feeding a water supply reservoir are assumed for a hypothetical community with defined demand functions. Prices are allowed to vary as a function of reservoir level, generally rising as reservoir levels fall. Increasing, decreasing and constant rates are tested. It is concluded that varying the price to reflect the increased value of scarce supplies can greatly reduce the risk of water supply shortages. It is concluded also that varying incremental, or conservational, pricing policies not only reduces the risk of shortages, but also lowers the average price to the community while rewarding the low consumption user with lower average rates. (Bell-Cornell)
W73-04354

6B. Evaluation Process

A SURVEY OF ATTITUDES TOWARDS THE MISSISSIPPI RIVER AS A TOTAL RESOURCE IN MINNESOTA, Minnesota Univ., St. Paul. Water Resources Research Center.

N. J. Boron, E. J. Cecil, and P. I. Tiedman.

Available from the National Technical Information Service as PB-214 096, \$3.00 in paper copy, \$0.95 in microfiche. Bulletin 55, September 1972. 160 p, 19 fig, 70 tab, 23 ref. OWRR B-049-Minn (1). 14-31-0001-3295.

Descriptors: *Attitudes, *Mississippi River, Water resources, *Minnesota, Water pollution, Recreation, Riparian Rights, Water utilization.

Identifiers: Socioeconomic index, *Spending priorities, *Land management information system.

A survey of the attitudes of Minnesotans toward the use, maintenance and development of the Mississippi River in Minnesota was conducted. Background information on the diverse physical nature of the project Universe (those 23 Minnesota counties which the River flows through or is adjacent to) was collected covering the topics of waterflow, soils, population change, changing riparian land use, and recreational opportunities. Great physical and cultural diversity was found in the project Universe. Attitudes of residents were measured by a 40 item mail questionnaire sent to 5,000 residents of the project Universe; 101 in-depth interviews were also conducted. Respondents provided data on their characteristics, evaluated the desirable and undesirable characteristics of the River, evaluated the role of media in providing them with environmental information, expressed attitudes towards the use of the River, how River pollution should be controlled and financed, and provided data on what aspects of their life styles they were and were not willing to change to improve environmental quality. Secondary students were also surveyed in a separate effort to quantify significant difference of attitudes held by youth and adults. Two significant findings were that Minnesotans do not desire to curtail their uses of energy to improve environmental quality, and the perceived present uses of the River are exactly opposite to the uses the public desires. (Walton-Minnesota)
W73-03905

NATIONAL WATER RESEARCH OPPORTUNITIES, Nebraska Univ., Lincoln. Water Resources Research Inst.

H. R. Stucky, and W. Viessman, Jr. Available from the National Technical Information Service as PB-214 097, \$3.00 in paper copy, \$0.95 in microfiche. Nebraska Water Resources Research Institute Lincoln, Completion Report, June 1972. 141 p. OWRR X-115 (3426) (1).

Descriptors: *Water resources research, *Research needs, Research opportunities, *Research areas, Water research problems, *Research management.

Identifiers: Research and development, *Research priorities, Social values, *Planning.

A university community input is provided to assist the Committee on Water Resources Research in developing a sequel to the Ten-Year Program of Federal Water Resources Research. The university input reflects information which came from questionnaires completed by the heads of state planning agencies and from the direct contacts of the Universities Council on Water Resources consultants with representatives of state and federal governmental agencies. The report is in four major sections: water research and social goals, major water research problems, research areas - classification and emphasis, and research management.
W73-03911

DATA RECORD FOR PUBLIC ATTITUDES TOWARD REUSE OF RECLAIMED WATER, California Univ., Los Angeles. Water Resources Center.

W. H. Bruvold.

Available from the National Technical Information Service as PB-214 239, \$11.25 in paper copy, \$0.95 in microfiche. California Water Resources Center, Los Angeles, Contribution No 137, 1972. 181 p. OWRR Project C-2015 (1).

Descriptors: *Reclaimed water, *Attitudes, *Behavior, *California, Recreation facilities, Desalination, Deminerization, Imported water, Public rights, Domestic water, Beneficial use, *Data collections, *Water reuse.
Identifiers: *Public attitudes.

Contents: Coding Manual; Summary Data for the Ten Towns Surveyed; Summary Data for Northern Respondents; Summary Data for Southern Respondents; Summary Data for All Respondents; Two Way Chi-Square Analyses; Tabulation Print-outs for Selected Variables; Guttman Analyses; Attitudinal Analyses by Categorized Variables; and Attitudinal Analyses by Multiple Regression. (See also W73-02601)
W73-04059

A STUDY OF WATER INSTITUTIONS OF HAWAII, Hawaii Univ., Honolulu. Water Resources Research Center.

E. T. Morahan, and H. Yamauchi.

Available from the National Technical Information Service as PB-214 125, \$3.00 in paper copy, \$0.95 in microfiche. Technical Report No. 58, August 1972. 39 p, 2 fig, 2 tab, 23 ref, append. OWRR A-019-HI (3).

Descriptors: Economics, *Institutions, *Water policy, *Decision-making, Conservation, *Governments, *Hawaii, Administration, *Management.

The structure, functioning and performance of water institutions in Hawaii is studied within a 'hierarchy of decision-levels' framework developed by S.V. Ciricly-Wantrap. The study framework provides new opportunities for gaining insights into the economic nature of water institutions from the standpoint of water policy. The ultimate goal is a fully integrated water quantity and quality management system for Hawaii which takes into account all the interrelationships of the hydrologic cycle and the functioning of the federal structure of American government.
W73-04062

A PROCEDURE AND CASE STUDY DEMONSTRATIONS FOR EVALUATING THE COST OF THERMAL EFFLUENT CONTROL FOR PROPOSED STEAM-ELECTRIC GENERATING UNITS, Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 05G.
W73-04070

STOCHASTIC STRUCTURE OF WATER USE TIME SERIES, Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 04A.
W73-04098

REGIONAL INVENTORY REPORT—SOUTH ATLANTIC-GULF REGION, PUERTO RICO AND THE VIRGIN ISLANDS. Corps of Engineers, Atlanta, Ga, South Atlantic Div.
For primary bibliographic entry see Field 04B.
W73-04228

LEARNING, EXTERNAL BENEFITS, AND SUBSIDIES IN WATER DESALINATION, California Univ., Davis. Dept. of Agricultural Economics.
G. C. Rausser, C. Willis, and P. Frick.
Water Resources Research, Vol 8, No 6, p 1385-1400, December, 1972. 1 fig, 7 tab, 12 equ, 2 apen, 33 ref.

Descriptors: Water resources, *Desalination, *Investment, *Decision making, *Costs, Estimating, Sea water, *Simulation analysis, Computers, Mathematical models, Systems analysis.
Identifiers: Learning, *External benefits, *Subsidies, Bayesian methods, Distillation plants.

In the absence of the recognition of learning in new technologies such as desalting, water resources investment decisions may be erroneous for two reasons. First, neglecting cost reductions over time due to 'learning by doing' leads to the overestimation of costs. Second, since learning in a particular desalting plant may result in external learning benefits to other plants, these externalities may serve as the basis for the determination of a subsidy intended to internalize these benefits. Estimates of learning (cost) functions for large-scale seawater distillation plants are provided. To incorporate prior information into the estimation process, Bayesian methods are used. Alternative specifications of these learning functions are then employed in the context of a measure of external learning benefits to estimate by computer simulation the moments of these benefits. The employing of such a measure in various water resource decision models is discussed. It is obvious that the estimates of external learning benefits provided can be introduced into investment-sequencing models that seek to optimize the sequencing and timing of a number of alternative projects. (Bell-Cornell)
W73-04274

FLEXIBLE PRICING IN WATER SUPPLY PLANNING—FOR FLEXIBLE ENGINEERS, Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W73-04354

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

THE ROLE OF THE SPECIALIST WATER TREATMENT COMPANY, For primary bibliographic entry see Field 05F.
W73-04002

Field 06—WATER RESOURCES PLANNING

Group 6C—Cost Allocation, Cost Sharing, Pricing/Repayment

POND CLEANING COST CUT 50 PERCENT BY AUGER-EQUIPPED BARGE.
For primary bibliographic entry see Field 05G.
W73-04004

A MATTER OF DESIGN,
Stein (Richard G.) and Associates, New York.
R. G. Stein.
Environment, Vol 14, No 8, p 16-29, October 1972.
4 photos, 18 ref.

Descriptors: *Architecture, *Lighting, *Electricity, *Buildings, Electric power production, Electric power demand, Construction costs, Heating, Cooling, Efficiencies, Air conditioning.
Identifiers: *Electric heating, *Electric cooling.

Construction and operation of buildings consumes more than 57 percent of all electricity produced in the U.S. Of the total electricity produced in 1970, 7.5 percent was used by the construction industry, directly in construction or indirectly through the production of materials used in construction. Built-in standards for lighting, heating, cooling, and other electrical uses required almost 50 percent. Yet much of this was wasted energy. Certain changes could be made in building design and construction that would reduce by at least 25 percent the energy required to construct and maintain buildings. While the characteristic shape of the curve will not change, the energy required to build and maintain the building can be decreased by at least 25 percent. This would have a saving in energy at the source of 35 percent, and this figure carried back into the whole national energy picture can account for 8 percent of all energy used for all purposes. (Oleszkiewicz-Vanderbilt)
W73-04030

A PROCEDURE AND CASE STUDY DEMONSTRATIONS FOR EVALUATING THE COST OF THERMAL EFFLUENT CONTROL FOR PROPOSED STEAM-ELECTRIC GENERATING UNITS,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 05G.
W73-04070

A PROCEDURE FOR ESTIMATING COSTS OF THERMAL EFFLUENT MODIFICATIONS FOR EXISTING STEAM-ELECTRIC GENERATING STATIONS,
Center for the Environment and Man, Inc., Hartford, Conn.
For primary bibliographic entry see Field 05G.
W73-04071

A STUDY OF THE MARINE RESOURCES OF DORCHESTER BAY,
Massachusetts Dept. of Natural Resources, Boston.
A. P. Chesmore, S. A. Testaverde, and F. P. Richards.
Mass Dep Nat Resour Div Mar Fish Monogr Ser. 10, p 1-41, 1971, Illus.
Identifiers: Algae, Bass, Clams, Cod, *Dorchester Bay (Mass), Finfish, Flounder, Haddock, Hake, Lobsters, Mackerel, *Marine resources, *Massachusetts, Aquatic plants, Smelt.

Investigations in the Dorchester Bay area during 1967 indicated that a minimum of \$308,071 was realized from the commercial harvest of lobsters. An estimated 1886.5 bushels of soft shell clams, with a wholesale value of \$18,865 were harvested from the intertidal flats of Boston and Quincy. Twenty-one species of finfish, totalling 7878 individuals were collected during sampling operations at 7 shore and 4 offshore stations. Fin fish species taken by sport fishermen include striped bass, rainbow smelt, winter flounder, Atlantic mackerel, Atlantic cod, haddock, Atlantic tomcod

and red hake. An estimated \$26,950 was spent by approximately 7714 sport fishermen utilizing party and charter boats, boat launching ramps, and marina docks within Dorchester Bay for fishing. Thirty spp. of algae and 12 spp. of vascular plants were collected from the waters and salt marshes of the study area. The 363 acres of salt marsh located in the study area should be protected from indiscriminate alteration and destruction because of their value to marine fisheries. The total estimated minimum economic value derived from the utilization of the marine fisheries resources of Dorchester Bay during 1967 amounted to \$353,886.—Copyright 1972, Biological Abstracts, Inc.
W73-04189

ELEMENTS OF SELECTION FOR SECONDARY WASTE TREATMENT SYSTEMS,
International Paper Co., New York.
For primary bibliographic entry see Field 05D.
W73-04287

CLEAN WATER AND POWER,
Sacramento State Coll., Calif.
For primary bibliographic entry see Field 05G.
W73-04436

6D. Water Demand

HYDROLOGIC REGIMEN OF LOWER TONTO CREEK BASIN, GILA COUNTY, ARIZONA--A RECONNAISSANCE STUDY,
Geological Survey, Phoenix, Ariz.
For primary bibliographic entry see Field 03B.
W73-04099

INTEGRATION OF THE AGRICULTURAL DEMAND FUNCTION FOR WATER AND THE HYDROLOGIC MODEL OF THE PECOS BASIN,
New Mexico Univ., Albuquerque. Dept. of Economics.
M. Gisser, and A. Mercado.
Water Resources Research, Vol 8, No 6, p 1373-1384, December, 1972. 1 fig, 7 tab, 2 append, 8 ref.

Descriptors: Economics, *Parametric hydrology, Agriculture, *Water demand, *Imported water, *Costs, *Estimating, *Linear programming, *Artificial recharge, *New Mexico, Systems analysis, Mathematical models, Pumping, Water table, Discharge (Water), Irrigation, Confined water, Shallow water, Equations, Forecasting.
Identifiers: *Pecos River basin, *Demand function, Roswell basin, San Andres aquifer.

The result of integrating the agricultural sector with the aquifer of the Pecos basin is presented. In particular, steady state solutions to hydrologic and economic equations are given in which imported water is artificially recharged to the aquifer and its cost is combined with the cost of pumping. A two-cell model (consisting of five equations) for the Pecos basin aquifer is developed, which yields optimal steady state solutions for a variety of prices of imported water. One cell is for the confined aquifer and the other is for the shallow aquifer. The hydrologic solution of the model yields two linear steady state functions that relate the water table in the two cells to other hydrologic variables, such as recharge, discharge, and irrigation. The cost of pumping water is also estimated. The agricultural demand function for irrigation water is empirically estimated by applying parametric linear programming. The demand function for water is linked to the water table hydrologic equations. Solutions are found for a range of expected prices of imported water. Two basic assumptions underlie this study: 1) Imported water will be artificially recharged into the ground; and 2) farmers will pay the full price of imported water. (See also W73-13993) (Bell-Cornell)

W73-04277

6E. Water Law and Institutions

NATIONAL WATER RESEARCH OPPORTUNITIES,
Nebraska Univ., Lincoln. Water Resources Research Inst.
For primary bibliographic entry see Field 06B.
W73-03911

THE OCEANS HAVE BECOME THE SINKS OF THE WORLD,
For primary bibliographic entry see Field 05C.
W73-03989

DOING TIME TAKES ON A NEW MEANING FOR THE WASTEMAKERS,
For primary bibliographic entry see Field 05G.
W73-04010

A STUDY OF WATER INSTITUTIONS OF HAWAII,
Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 06B.
W73-04062

TYBEE ISLAND, GEORGIA; GALVESTON HARBOR, TEXAS.

Hearing—Subcomm. on Rivers and Harbors-Comm. on Public Works, U.S. House of Representatives, Ninety-Second Congress, June 21, 1971. 19 p, 4 tab.

Descriptors: *Environmental effects, *Channel improvement, *Shore protection, *Beach erosion, Texas, Georgia, Soil stabilization, Coastal structures, Artificial beaches, Recreation, Navigation, Aquatic life, Dredging, Excavation, Spoil banks, Dikes, Check structures, Federal government, Administrative decisions, Erosion control, Groins (Structures).
Identifiers: *Congressional hearings.

The Subcommittee heard testimony on the following two proposed projects on Tybee Island, Georgia and Galveston Harbor, Texas. First, the restoration and improvement of Tybee Island, Georgia, located six miles south of Hilton Head, South Carolina. The island's beach area has been severely eroded; to correct this, groins and beach sandfill along with periodic renourishment is proposed. Since Tybee Island is one of Georgia's two salt water beaches available to the general public, the project is urgently needed to meet the demands of the public and to alleviate overcrowding on the lower section of the beach. Areas of crustacean habitat will be eliminated by the dry beach berm. The second project discussed is deepening of the existing 36-foot channel to 40 feet for a distance of four miles between Galveston, Texas and Pelican Island. Also a dike and water control structure will be constructed on Pelican Island to contain spoil material. Not only will the project improve the maritime commerce of Galveston, but navigation within the channel will be improved. Spoil will be deposited on Pelican Island with the construction of the dike and water control structure as check structures. Little permanent effect is expected on the aquatic habitat or the turbidity of the channel. Studies are in progress on the effects of spoil deposition on the aquatic life surrounding Pelican Island. These advance studies will serve as a guide for future dredging operations along the Gulf Coast. (Beardley-Florida)
W73-04452

WATER RESOURCES PLANNING—Field 06

Water Law and Institutions—Group 6E

MURRELLS INLET, SOUTH CAROLINA: NORTHPORT HARBOR, WISCONSIN.

Hearing—Subcomm. on Rivers and Harbors—Comm. on Public Works, U.S. House of Representatives, Ninety-second Congress, October 3, 1971. 26 p, 3 tab.

Descriptors: *South Carolina, *Wisconsin, *Channel improvement, *Harbor, *Navigation, Federal government, Navigable rivers, Recreation, Streams, Economic impact, Water resources development, Legislation, Environmental effects, Administrative agencies, Transportation, Channels, Erosion, Fishing, Dredging, Cost-benefit analysis, Rivers and Harbors Act.

Identifiers: *Congressional hearings, *Environmental Impact Statements, Murrells Inlet (South Carolina), Northport Harbor (Wisconsin).

This hearing consists of testimony by the Corps of Engineers on two projects. The projects are at Murrells Inlet, Georgetown County, South Carolina, and Northport Harbor in Wisconsin. The Murrells inlet proposed plan recommends channel dredging and jetties on both sides of the inlet. The project would stabilize the channel through the inlet with depths necessary to enable free and unhindered navigation by present and prospective users. Federal/local cost-sharing policies are outlined based on the Rivers and Harbors Act of 1970 to consider that recreational maintenance cost be borne by the federal government. The Environmental Impact Statement cites benefits of renewed beaches, improved fishing and increased recreational usage. Benefit-cost ratio is 1.7. The Northport Harbor, Wisconsin, project consists of construction of three breakwaters and the dredging of a maneuvering area and channels to deep water in Porte des Morts Passage. The environmental impact statement states that the project would provide a safe and dependable all-weather mainland harbor for the Washington Island Ferry Line and a harbor for recreational craft. Benefit-cost ratio is 2.1. All concerned departments report favorable on both projects. (Tolle-Florida)

W73-04453

RIVER BASIN MONETARY AUTHORIZATION—1969, CHESAPEAKE BAY BASIN IN COMPREHENSIVE STUDY.

Hearing—Subcomm. on Flood Control—Comm. on Public Works, U.S. House of Representatives, Ninety-first Congress, December 9, 1969. 21 p, 18 tab.

Descriptors: *Chesapeake Bay, *Rivers and Harbors Act, *Budgeting, *Hydraulic models, *River basin development, Model studies, Research and development, Theoretical analysis, Bays, Federal government, Federal budget, Water resources development, Water pollution, Watersheds (Basins), Basins, Watershed management, River basins, Planning, Potential water supply, Comprehensive planning.

Identifiers: *Congressional hearings.

The 1968 Omnibus River and Harbor and Flood Control Act provided funds for one year for 13 river basins throughout the country. Since the monetary authorizations for 12 of these river basins will be exhausted within a short time, the Subcommittee discussed at some length the deficit in each individual basin as projected through calendar years 1970 and 1971. This periodic additional authorization procedure allows the Subcommittee to review and control the rate of accomplishment of the basin plans. An increase of \$330 million in the basin monetary authorization is needed to maintain satisfactory construction progress. Also discussed was the \$9 million proposed additional authorization for the Chesapeake Bay Basin Comprehensive study in order that the Corps of Engineers may complete its work

which, when completed, will project economic development with the Bay area and the consequent resource demands. It will serve as a viable management guide to maintaining the environmental integrity of the Chesapeake Bay while encouraging beneficial resource use and enjoyment. The early completion of the physical hydraulic model is vital to the following decisions: pollution abatement, productivity of the Bay, disposal of dredging, siting of industries and generating plants and regulation of all tributary river flows. (Beardsley-Florida)

W73-04454

THE 92ND CONGRESS—GOOD AND BAD.

Conservation Report, 92nd Cong, 2d Sess, Report No 33, p 350-360, October 20, 1972.

Descriptors: *Legal aspects, *Federal government, *Legislation, *Environmental control, Conservation, Water pollution control, Waste disposal, Strip mine wastes, Pollution taxes (Charges), Land use, Natural resources, Fish, Wildlife refuges, Coastal engineering, Ocean circulation, Pesticides, Powerplants, Recreation, Water resources development.

An assessment is presented of the conservation-environmental accomplishments of the 92nd Congress. For the first full Congress in what has been called the 'Environmental Decade', the record has to be considered a disappointment. On paper, the President proposed an ambitious environmental program, sending more than 25 environmental bills to Congress. However, for one reason or another, the followup on many of these proposals was sporadic or confusing. The biggest environmental action taken by the 92nd Congress was passage of the Federal Water Pollution Control Act Amendments of 1972. Among the issues considered, but not passed, establishment of a National Land Use Policy is probably the biggest and most important environmental issue facing the 93rd Congress. Pollution taxes to encourage the installation of pollution control equipment by making pollution unprofitable is an explosive issue to be faced soon. Establishing a Department of Natural Resources is a subject looked at extensively by the 92nd Congress and is projected for serious consideration by the 93rd Congress. Environmentalists worked hard to stave off an attack on the National Environmental Policy Act (NEPA). Conservation and environmental legislation considered by the 92nd Congress is reviewed. (Tolle-Florida)

W73-04456

TO AUTHORIZE CONSTRUCTION, OPERATION AND MAINTENANCE OF THE NORTH LOUP DIVISION, PICK-SLOAN MISSOURI BASIN PROGRAM, NEBRASKA.

Report—Comm. on Interior and Insular Affairs—United States Senate, 92nd Cong, 2d Sess, September 12, 1972. 15 p.

Descriptors: *Irrigation systems, *River basin development, *Nebraska, *Reservoir construction, Water resources development, Federal government, Distribution systems, Supplemental irrigation, Irrigation, Irrigation programs, Irrigation canals, Water allocation (Policy), Wildlife conservation, Water distribution (Applied), Pumping, Reservoirs, Diversion, Diversion structures, Dams, Engineering Structures, Irrigation ditches. Identifiers: *Congressional hearings, Flood Control Act of 1944.

The Committee recommended the passage of the proposed North Loup Division, Missouri River Basin Project. Included within the amendments to the original bill are the following project purposes: providing irrigation water for 53,000 acres of land, enhancement of outdoor recreation opportunities, and the development of fish and wildlife resources. The principal features of the project in-

clude the Calamus and Davis Creek Dams and Reservoirs, Kent Diversion Works, principal irrigation canals, pumping facilities, associated irrigation distribution and drainage works, and facilities for public outdoor recreation and fish and wildlife developments. Total capacities of the two storage reservoirs will be 128,200 and 32,500 acre-feet respectively. The irrigation development will stabilize the rural economy and encourage diversification of crops in an area which presently receives only marginal rainfall. Adverse effects include: withdrawal of natural river flows, which will have some impact on the project river's ecosystems; irrigation return flows increasing the dissolved solids in the project rivers; and the two reservoirs operating at full capacity will inundate 13 miles of the Calamus River and 6,300 acres of woodland. (Beardsley-Florida)

W73-04459

TEXAS SEASHORE BOUNDARY LAW: THE EFFECT OF NATURAL AND ARTIFICIAL MODIFICATIONS,

Texas Law Inst. of Coastal and Marine Resources, Houston.

C. E. Dinkins.

Houston Law Review, Vol 10, p 43-83 (1972). 250 ref.

Descriptors: *Texas, *Riparian rights, *Boundary disputes, *Boundaries (Surfaces), Accretion (Legal aspects), Legislation, Judicial decisions, Legal aspects, Earth-water interfaces, Seashores, Alluvial, Avulsion, Erosion, Groins (Structures), Dredging, Shores, Landfills, Navigable waters, Federal government, Piers, Water law, Gulf of Mexico.

Identifiers: Submerged lands.

Texas statutory and case law is emphasized. Rules of other jurisdictions are discussed to show their treatment of seashore boundary alterations. The various doctrines the Texas courts have adopted to establish private or state ownership of littoral lands and lands submerged by tidal waters are discussed. Also included are Texas rules of reliction, accretion, erosion, avulsion, and submergence - boundary alterations that result primarily from natural forces. An examination of Texas law relative to artificial modifications of the shoreline such as landfill, draining and damming to reclaim marshland; dredging; building of structures such as wharves and piers; extraction of groundwater, oil and gas; and cutting of land canals is also included. Some interim changes in Texas laws affecting the seashore and adjoining lands are proposed. Also discussed is the 1969 Texas Legislature's moratorium on the sale and leasing of state-owned submerged lands, islands, beaches, and estuaries. Because of diverse state regulation of activities that modify the shoreline and that are potentially damaging to the ecology, the state should provide some final review and licensing authority for all activities that might affect the land and water immediately adjacent to the Texas shoreline. (Tolle-Florida)

W73-04460

THE EXPANSION OF FEDERAL COMMON LAW AND FEDERAL QUESTION JURISDICTION TO INTERSTATE POLLUTION.

For primary bibliographic entry see Field 05G.

W73-04461

NON-POINT SOURCE POLLUTION FROM AGRICULTURAL, RURAL, AND DEVELOPING AREAS.

For primary bibliographic entry see Field 05B.

W73-04462

AUTHORIZING THE STUDY OF A SEGMENT OF COLORADO FOR POSSIBLE INCLUSION

Field 06—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

IN THE WILD RIVERS SYSTEM.

Report—Comm. on Interior and Insular Affairs—United States Senate, 92d Cong., 2d Sess., September 12, 1972. 5 p.

Descriptors: *Wild River Act, *Colorado River, *Aesthetics, *Preservation, Scenery, Legislation, Wild Rivers, Water policy, Recreation, Rivers, Running water, Wildlife conservation, Interstate rivers, Water sports, Conservation.

Identifiers: *Wild and Scenic Rivers Act, *Congressional hearings.

The Committee recommends that the bill to amend the Wild and Scenic Rivers Act to include a 36-mile segment of the Colorado River from the Utah-Colorado border downstream to the junction of the Dolores River in Utah be passed. Originally the bill (S.2901) called for the inclusion of a 13 1/2-mile segment. However, this was increased to a 36-mile addition, conforming to a suggestion by the Administration. Of this reach of river, the segment called Granite Canyon is the most widely known with 13 1/2 miles of exciting water. The Canyon has many rapids and wildlife including deer, cougar, snowy egrets and beaver. The Act as amended will bring to 28 the total of potential additions to the National Wild and Scenic Rivers Systems. (Beardsley-Florida)

W73-04464

LAW OF THE SEA.

Hearing—Subcomm. on Oceans and Atmosphere—Comm. on Commerce, United States Senate, 92d Cong., 2d Sess., October 3, 1972. 137 p.

Descriptors: *Law of the Sea, *International commissions, *Oceans, *United Nations, United States, Interagency cooperation, International law, International waters, Jurisdiction, Governments, Commercial fishing, Straits, Legal aspects, Water pollution, Marine biology, Federal government, Foreign waters, Beds under water.

Identifiers: Coastal waters, Territorial seas (Judicial).

This hearing begins an examination of a subject of critical importance to the ocean-related interests of the United States—the forthcoming Law of the Sea Conference scheduled to be held in 1973. The legal subjects up for consideration at this Conference include fishing jurisdiction, scientific research, marine pollution, breadth of the territorial sea, passage through straits, and the international regime for the deep seabed, among others. There can be little doubt but that the outcome of this Conference will significantly affect the ocean activities of citizens of the United States, not only in coastal margins of our country, but also in the distant waters of the world. This hearing reviews the recent history of the preparatory meetings of the Conference and generally examines the U.S. positions on the legal issues before the Conference. Several members of the Interagency Task Force on Law of the Sea testified on this subject with particular emphasis on the potential effect of these deliberations on U.S. commercial interests. (Tolle-Florida)

W73-04465

EDEN PRESERVED,

For primary bibliographic entry see Field 05G.

W73-04466

CONFERENCE IN THE MATTER OF POLLUTION OF THE INTERSTATE WATERS OF THE MERRIMACK AND NASHUA RIVERS AND THEIR TRIBUTARIES, MASSACHUSETTS-NEW HAMPSHIRE AND THE INTRASTATE PORTIONS OF THOSE WATERS WITHIN THE STATE OF MASSACHUSETTS.

Federal Water Pollution Control Administration, Washington, D.C.

For primary bibliographic entry see Field 05G.
W73-04469

BAUERLE V. BOARD OF COUNTY ROAD COMMISSIONERS FOR THE COUNTY OF CHARLEVOIX (ALL RIPARIAN OWNERS ACCORDED REASONABLE USE OF SURFACE OF ENTIRE LAKE).

Descriptors: *Riparian rights, *Reasonable use, *Judicial decisions, *Michigan, Ownership of beds, Lakes, Legal aspects, Riparian land, Landfills, Beds, Obstruction to flow, Water law, Adjacent landowners, Water rights, Highways.

Identifiers: Injunctions (Mandatory).

Plaintiff riparian landowner brought an action against defendants adjoining riparian landowner and county road commissioners for injunctive relief to remove fill placed in a pond. Both adjacent landowners were riparian owners on the small pond. The defendant consented to the county constructing a road across the pond on his property. Plaintiff contended that defendants did not have any title to the submerged lands in the pond and that their actions infringed on plaintiff's riparian rights. The Supreme Court of Michigan ruled that where there are several riparian owners to an inland lake, such owners may use the surface of the whole lake so far as they do not interfere with the reasonable use of the waters by the other riparian owners. The court held that the defendants had to remove the road fill and restore the pond to its original condition. They also enjoined further interference with plaintiff's quiet enjoyment of his riparian rights. (Nielsen-Florida)

W73-04470

ENVIRONMENTAL DEFENSE FUND, INC. V. CORPS OF ENGINEERS OF THE UNITED STATES ARMY (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT).

348 F. Supp. 916-954 (N.D. Miss. 1972).

Descriptors: *United States, *Decision making, *Channeling, *Mississippi River Basin, *Judicial decisions, River systems, Environmental effects, Canal construction, Navigation, Channel improvement, Civil engineering, Legal aspects, Federal jurisdiction, Legislation, Project planning, River basin development, Transportation, Aquatic habitat, Watercourses (Legal aspects), Legal review, Water law, Administrative decisions.

Identifiers: *National Environmental Policy Act, *Environmental Impact Statements, Corps of Engineers.

Plaintiff environmentalists brought an action against defendants, Corps of Engineers and others, to restrain them from initiating construction of the Tennessee-Tombigbee project designed to provide a continuous waterway from Tennessee, the upper Mississippi and Ohio Valleys to Mobile, Alabama. Plaintiff contended that the defendant had violated various substantive and procedural requirements of the National Environmental Policy Act of 1969 (NEPA). Dismissing the complaint, a United States District Court in Mississippi noted with respect to the NEPA: an Environmental Impact Statement (EIS) must include a discussion of objections raised by governmental agencies and it must be written in non-technical language; an EIS does not have to include maps and other background data which is insignificant; NEPA's requirement for giving previously unqualified environmental factors appropriate weight in the decision-making process does not require computer analysis. The court held that the Corps of Engineers impact statement, when considered with other statements of independent agencies, provided an adequate assessment of the project's environmental impacts, thus complying with NEPA. (Beardsley-Florida)

W73-04471

SAVANNAH RIVER BASIN INSPECTION.

Hearings—Subcomm. on Flood Control—Comm. on Public Works, U.S. House of Representatives, Ninety-first Congress, October 24, 1969. 41 p, 1 map.

Descriptors: *Watershed management, *Multiple-purpose projects, *River basin development, *Water resources development, South Carolina, Georgia, Water quality control, Recreation, Fishing, Wildlife, Conservation, Flood protection, Water supply development, Federal government, Navigation, Flood damage, Water supply, Navigable rivers, Wild rivers, hydroelectric power.

Identifiers: *Committee on Public Works.

This hearing took testimony on the comprehensive development of the Savannah River Basin, a project which has promise of bringing the area multiple-purpose water resource benefits. Primary and secondary social and economic benefits vital to total utilization of the river basin and national development are presented. Considerable testimony about the navigation features of the Savannah River Basin comprehensive development plan, and other aspects such as flood damage prevention, low-cost electric power, dependable water supply, recreation, fish and wildlife enhancement, and water quality improvement are included. The Savannah River Basin has an area of a little over 10,000 square miles, of which nearly 6,000 square miles are in eastern Georgia, and the remaining 4,500 square miles in South Carolina. (Tolle-Florida)

W73-04472

REPORT OF THE CHIEF OF ENGINEERS TO THE SECRETARY OF THE ARMY ON A STUDY OF STREAMBANK EROSION IN THE UNITED STATES.

Report of House Comm. on Public Works, 91st Cong., 1st Sess. (October 1969). 22 p, 1 map, 10 photo, 4 tab, 3 append.

Descriptors: *Erosion, *Erosion control, *Rivers and Harbors Act, *Bank protection, Channels, Drainage, Soils, Streamflow, Sediments, Sedimentation, Reservoirs, Flood control, Navigation, Projects, Maintenance, Maintenance costs, Project purposes, Bank stability, Land conservation, Soil conservation, Watershed management, Streams.

Identifiers: *Congressional hearings, Mississippi River, Tennessee Valley Authority.

Only one percent of the Nation's streams have been subjected to prior study. Eight percent of total stream bank miles are currently experiencing erosion to some degree. A candid admission of data insufficiency and inaccuracy is included. Factors considered important in the process of bank erosion included bank resistance, streamflow, sediment, channel equilibrium, and activities of man. Three federal agencies—the Departments of the Army, Agriculture, and Interior—are charged with the primary responsibility for the development, conservation, and management of the Nation's water resources. Previous efforts to control erosion by these agencies have usually been undertaken as an integral feature of a project designed to accomplish different purposes such as flood control, navigation, irrigation and others. Precise quantitative analysis and evaluation of damages from bank erosion are difficult to obtain. The annual cost of prevention exceeds the amount of damages severalfold. (Tolle-Florida)

W73-04473

LAKE MICHIGAN CLEAN-UP LAGGING.

For primary bibliographic entry see Field 05D.
W73-04547

RESOURCES DATA—Field 07
Data Acquisition—Group 7B

6G. Ecologic Impact of Water Development

SITING A THERMAL MULTI-PURPOSE ENERGY CENTER,
Bechtel France, Paris.
For primary bibliographic entry see Field 05C.
W73-04021

LOGICAL APPROACHES TO POWER SUPPLY AND ENVIRONMENT,
Black and Veatch, Kansas City, Mo. Power Div.
For primary bibliographic entry see Field 05G.
W73-04036

ENERGY RESOURCES OF THE UNITED STATES,
Geological Survey, Washington, D.C.
P. K. Theobald, S. P. Schweinfurth, and D. C. Duncan.
Geological Survey Circular 650, 1972, 27 p 22 fig.
22 ref.

Descriptors: *Energy, *Fuels, *Fossil fuels, *Nuclear energy, *Natural resources, *North America, Coals, Natural gas, Oil shales, Uranium radioisotopes.
Identifiers: *Energy resources, Uranium.

The total coal resource base in the United States is estimated to be about 3,200 billion tons, of which 200-390 billion tons can be considered in the category identified and recoverable. More than 70 percent of current production comes from the Appalachian basin. The total resource base for petroleum liquids is estimated about 2,900 billion barrels, of which 52 billion barrels are identified and recoverable. Of the total resource base, some 600 billion barrels are in Alaska or offshore from Alaska, 1,500 billion barrels are offshore from the United States, and 1,300 billion barrels are onshore in the conterminous United States. The total natural-gas resource of the United States is estimated to be about 6,600 trillion cubic feet, of which 290 trillion cubic feet is identified and recoverable. Uranium resources in conventional deposits, where uranium is the major product, are estimated at 1,600,000 tons of U3O8, of which 250,000 tons are identified and recoverable. The resources of heat in potential geothermal energy sources are poorly known. Oil shale is estimated to contain 26 trillion barrels of oil. None of this resource is economic at present, but if prices increase moderately, 160-600 billion barrels of this oil could be shifted into the identified-recoverable category. (Oleszkiewicz-Vanderbilt)
W73-04039

OPTIMAL PRICING POLICIES FOR CONJUNCTIVE URBAN WATER SUPPLY AND WASTE WATER TREATMENT SYSTEMS,
Environmental Dynamics, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 05G.
W73-04060

PLAQUEMINE LOCK CLOSURE, MISSISSIPPI RIVER AND TRIBUTARIES PROJECT, IBERVILLE PARISH, LOUISIANA, ASSOCIATED WATER FEATURES, BAYOU PLAQUEMINE AND GULF INTRACOASTAL WATERWAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, New Orleans, La.
For primary bibliographic entry see Field 08D.
W73-04457

EAST FORK OF WHITEMAKER RIVER, INDIA AND OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-04458

FRIOT RIVER, THREE RIVERS, TEXAS; MISSISSIPPI RIVER AT WINONA, MINNESOTA; SURVEY RESOLUTIONS.

Hearing—Subcomm. on Flood Control and Internal Development—Comm. on Public Works, U.S. House of Representatives, Ninety-Second Congress, July 27, 1971. 21 p, 4 tab.

Descriptors: *Environmental effects, Flood protection, Levees, *Channel improvement, *Flood control, *Texas, *Minnesota, *Mississippi River, Flood walls, Flood routing, Flood plains, Rivers, Cutoffs, Flow control, Water control, Water distribution (Applied), Hydraulic Structures, River regulation, Check structures, Earthworks, Engineering structures, Federal government, Administrative decisions.
Identifiers: *Congressional hearings, *Frio River (Tex.).

The Subcommittee recommended for approval to the full Committee two projects. The first consists of flood control improvements on the Frio River in the vicinity of Three Rivers, Texas. To overcome the flood problems, a 3,000-foot cutoff channel and a 4 1/2 mile protective levee with gated structures are proposed. Local health and safety will be improved with a corresponding 110 acre loss of mixed woodland and agricultural land for construction of the cutoff and levee. The cutoff channel will not increase the silt loading of the stream and the gated structures will preserve the present Frio River streamflow. The second project consists of flood control improvements providing a levee and flood wall on the Mississippi River along with interior drainage facilities to protect 8,000 acres of the city of Winona, Minnesota. These measures will complement existing federal flood control improvements in the upper portion of Winona and give protection to the industrial section of the city, thereby stimulating local industrial growth. Most of the project is not normally visible to the public and where it is, landscaping will be used to mitigate these effects. Also the turbidity of the river will be increased during construction. (Beardsley-Florida)
W73-04463

AUTHORIZING THE STUDY OF A SEGMENT OF COLORADO FOR POSSIBLE INCLUSION IN THE WILD RIVERS SYSTEM.

For primary bibliographic entry see Field 06E.
W73-04464

EDEN PRESERVED,
For primary bibliographic entry see Field 05G.
W73-04466

CONSTRUCTION OF WASTEWATER FACILITIES, RED OAK, TEXAS (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Environmental Protection Agency, Dallas, Tex.
Air and Water Programs Div.
For primary bibliographic entry see Field 05G.
W73-04468

ENVIRONMENTAL DEFENSE FUND, INC. V. CORPS OF ENGINEERS OF THE UNITED STATES ARMY (ADEQUACY OF ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Newark, Del.
For primary bibliographic entry see Field 06E.
W73-04471

FORMER CAMP PARKS SEWAGE DISPOSAL PLANT, PARCEL A-2 PLEASANTON, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
General Services Administration, Washington, D.C.
For primary bibliographic entry see Field 05G.
W73-04474

GENESEE RIVER BASIN, NEW YORK AND PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Water Resources Council, Washington, D.C.
For primary bibliographic entry see Field 08A.
W73-04475

CONCERNING CONSERVATION OF THE HOHE MARK FOREST MASSIF AND OF THE HIGH VALLEYS OF THE SCHWALM AND ITS TRIBUTARIES AT ELSENBORN,
Liege Univ. (Belgium). Dept. of Botany.
R. Schumacker, and A. Froment.
Nat Mosana, Vol 24, No 2/3, p 56-69, 1971, Illus.
Identifiers: *Beech-D, Belgium, Fagetum boreo atlanticum, *Forest management, Hohe Mark Massif, Plants, *Schwalm river basin (Bel), Tributaries, Valleys.

Forest management and the proposed construction of a military ski trail on the Hohe Mark massif et Elsenborn present grave dangers to the integrity of the countryside and to the exceptional biological value of these sites. Their importance especially results from the presence of a beech forest on the Hohe Mark plateau (Fagetum boreo-atlanticum) and that of various plant groupings of the river valleys of the Schwalm and its tributaries. This intervention by man will have short-term effects of appreciably altering the countryside and shortly thereafter will result in a progressive degradation of the plant groups, especially those of the valley bottoms, by eutrophication. Long-term effects will involve an increasingly severe degradation of the massif. The Hohe Mark beech forest and the valley bottoms and lower slopes of the Schwalm and its tributaries should be placed under protection as a nature preserve. Also, appropriate measures to maintain or restore the dynamics of the natural or semi-natural plant associations characterizing these sites should be initiated.—Copyright 1972, Biological Abstracts, Inc.
W73-04523

07. RESOURCES DATA

7A. Network Design

FINITE-DIFFERENCE CONVECTION ERRORS,
Oregon State Univ., Corvallis. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-03997

A NEW TOPOLOGICAL RELATIONSHIP AS AN INDICATOR OF DRAINAGE NETWORK EVOLUTION,
Environment Consultants, Inc, Dallas, Tex.
For primary bibliographic entry see Field 04A.
W73-04203

7B. Data Acquisition

THE STRUCTURE OF LIQUID WATER,
Delaware Univ., Newark. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 02K.
W73-03903

Field 07—RESOURCES DATA

Group 7B—Data Acquisition

ELECTROMAGNETIC PULSE SOUNDING FOR SURVEYING UNDERGROUND WATER,
Ohio State Univ., Columbus. Water Resources Center.

R. Caldecott, D. A. Irons, Jr., D. L. Moffatt, L. Peters, Jr., and R. J. Puskar.

Available from the National Technical Information Service as PB-214 122, \$4.85 in paper copy, \$0.95 in microfiche. Ohio Water Resources Center Project Completion Report No 401-X, October 1972. 81 p, 64 fig, 2 tab, 4 ref. OWRR B-028-OHIO (1).

Descriptors: *Soil moisture, *Moisture content, *Groundwater resources, *Electromagnetic waves, *Data collection, Analytical techniques, Instrumentation, Remote sensing, Soil moisture meters.

Identifiers: Signal interval frequency, Pulse generator.

A number of approaches have been explored for measuring the water content of soil electrically. In contrast with traditional measurements, which utilize electric currents at DC or at specific frequencies, techniques in this report are based on the transmission and reflection of sharp, regularly repeated pulses. Such pulse measurements are equivalent to measuring the electrical properties at all frequencies in a very wide band, and therefore the possibility of extracting the desired information is much greater than with single-frequency measurements. Because the information content of the signal is great, data processing can be used to extract those features which relate most directly to moisture content and reject those which appear to depend more on soil inhomogeneities. The measurements were made and processed under real-time computer control. They include the signal scattered from known buried targets, transmission measurements through the ground, and the measurement of reflections in a coaxial test cell, all with pulses containing very wide frequency bands. The results are encouraging in that definite correlations with moisture were found. (Woodard-USGS)
W73-03912

ELECTRICAL EARTH RESISTIVITY SURVEYING IN LANDFILL INVESTIGATIONS,
Illinois State Geological Survey, Urbana.
For primary bibliographic entry see Field 05B.
W73-03918

RADAR CROSS-SECTION MEASUREMENTS OF SNOW AND ICE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 02C.
W73-03920

ON THE CORRELATION OF THE TOTAL PRECIPITABLE WATER IN A VERTICAL COLUMN AND ABSOLUTE HUMIDITY AT THE SURFACE,
Aerospace Corp., El Segundo, Calif.
For primary bibliographic entry see Field 02B.
W73-03923

LAKE ICE SURVEILLANCE VIA AIRBORNE RADAR: SOME EXPERIMENTAL RESULTS,
Michigan Univ., Ann Arbor. Inst. of Science and Technology.

B. T. Larowe, R. B. Innes, R. A. Rendleman, and L. J. Porcello.
In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol I, p 511-521, 1971. 7 fig, 4 ref, append.

Descriptors: *Radar, *Lake ice, *Great Lakes, *Remote sensing, Surveys, Iced lakes, Mapping, Ice-water interfaces, Topography, Instrumentation, Data collections.

Fine-resolution radar images of Great Lakes ice forms were generated experimentally, to determine their capability for ice type classification. The images are substantially free of scanning-line structure and radar speckle. The temperate-zone fresh-water ice observed differs from the arctic sea ice imaged in earlier reported ice-surveillance programs. Images showing several ice forms and some land features are included. (Knapp-USGS)
W73-03937

REMOTE SENSING OF THE ARCTIC ICE ENVIRONMENT,

Raytheon Co., Alexandria, Va. Equipment Div. A. Biache, Jr., C. A. Ray, and R. Bradie.
In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol I, p 523-561, 1971. 23 fig, 1 tab, 7 ref.

Descriptors: *Remote sensing, *Sea ice, *Arctic, Radar, Infrared radiation, Aerial photography, Navigation, Data collections, Instrumentation, Calibrations, Mapping.

Remote sensing of the Arctic ice environment is an important tool for the operation of shipping in ice covered waters. Remote sensing in an environment such as the Arctic probably is the best means for obtaining information under difficult circumstances. Tests were made of the side-looking radar (SLR), thermal infrared scanner (IR), panoramic camera (PAN), and laser profilometer (LASER). Three sensors were mounted in a DC-4 and flown by the Canadian Government. These included the IR, PAN, and LASER. The SLR was flown in a C-130 aircraft. The radar was flown at an 8000 foot altitude, the other sensors were flown between 1000 to 3000-foot altitudes. All sensor records were indexed and evaluated for quality by comparing duplicate positive transparencies with the original negatives. Analysis of all-weather side-looking radar imagery; comparative evaluation of correlateable multi-sensor recordings, particularly the low altitude infrared, panoramic, and laser sensor imagery and data; spectrum analysis of sea ice using the laser altimeter records for input; and sensor utilization and the establishment of an adequate data base and data handling capability based upon such sensor use are discussed. (Knapp-USGS)
W73-03938

ENERGY SPECTRA OF SEA WAVES FROM PHOTOGRAPHIC INTERPRETATION,

Raytheon Co., Wayland, Mass.
R. S. Kasevich, C. H. Tang, and S. W. Henriksen.
In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol I, p 607-624, 1971. 8 fig, 16 ref.

Descriptors: *Aerial photography, *Ocean waves, *Fourier analysis, *Remote sensing, *Photogrammetry, Albedo, Mapping, Surveys, Data processing, Data collections, Slopes, Waves (Water), Statistical methods, Instrumentation. Identifiers: *Energy spectra (Ocean waves).

An optical Fourier transform analysis of a photograph of the sea taken under a known skylight irradiance can provide a quantitative description of the sea wave energy spectrum. A first order analysis of the geometric optics of the camera-sea surface-skylight indicates that the optical density of the aerial negative along the two orthogonal coor-

dinate axes is related to the sea surface slope. If the average spatial variation of the optical density is linear, then a functional representation of the wave-number spectrum is recorded in the Fourier transform photograph. (Knapp-USGS)
W73-03939

AN EXPERIMENTAL MODEL FOR AUTOMATED DETECTION, MEASUREMENT AND QUALITY CONTROL OF SEA-SURFACE TEMPERATURES FROM ITOS-II DATA,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 07C.
W73-03940

A METHOD FOR CALCULATING WATER DEPTH, ATTENUATION COEFFICIENTS AND BOTTOM REFLECTANCE CHARACTERISTICS,

Michigan Univ., Ann Arbor.
W. L. Brown, F. C. Polcyn, and S. R. Stewart.
In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol I, p 663-682, 1971. 15 fig, 4 ref.

Descriptors: *Remote sensing, *Lake Michigan, *Depth, Infrared radiation, Data collections, Mapping, Data processing, Bathymetry, Instrumentation, Measurement, Photometry.

By using data from a multispectral scanner, reasonably accurate remote measurements of water depth can be made using average values for water attenuation coefficients and bottom reflectances. Conversely, in regions where the water depth is known, the water attenuation coefficients and bottom reflectance characteristics can be computed. Multispectral scanner data collected over the shoreline of Lake Michigan were analyzed using a computer for the purpose of obtaining water depth measurements in the vicinity of Bridgeport, Michigan. Data on water attenuation and bottom reflectance could be extracted directly from the multispectral scanner data. Data are presented on attenuation coefficients and bottom reflectance characteristics for a test site where the depth varied from 2 to 28 feet. The water attenuation coefficients are a function of position in the scene, leading to possible by-product information on suspended particulate matter and turbidity. This information is of importance for measuring water depth of a large-area basis, for monitoring discharges into the water, or determining concentrations of suspended materials, and other observations where water properties are of significance. A depth map and a depth profile are also presented to illustrate the use of average attenuation and reflectance data for large-area depth measurements. (Knapp-USGS)
W73-03941

SEA SURFACE TEMPERATURE MAPPING OFF THE EASTERN UNITED STATES USING NASA'S ITOS SATELLITE,

National Environmental Satellite Service, Washington, D.C.
P. K. Rao, A. E. Strong, and R. Koffler.
In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol I, p 683-691, 1971. 6 fig, 7 ref.

Descriptors: *Remote sensing, *Satellites (Artificial), *Water temperature, *Infrared radiation, *Ocean currents, Currents (Water), Ocean circulation, Data collections, Oceanography, Instrumentation.

RESOURCES DATA—Field 07

Data Acquisition—Group 7B

High resolution (approximately 8 km) infrared imagery from NASA's ITOS-1 satellite demonstrates the utility of synoptic sea-surface temperature information. The northern edge of the Gulf Stream, the slope, and shelf waters display complex thermal characteristics with distinct temperature gradients separating these three water masses. This type of information can be very useful for increasing our understanding of many physical phenomena occurring over Earth's oceans. (Knapp-USGS)
W73-03942

SURFACE WATER MOVEMENT STUDIES UTILIZING A TRACER DYE IMAGING SYSTEM,

Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.

J. R. Eliason, H. P. Foote, and M. J. Doyle.

In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol I, p 731-750, 1971. 12 fig, 8 ref.

Descriptors: *Tracers, *Dye releases, *Remote sensing, *Data processing, Data collections, Path of pollutants, Fluorescent dye, Water circulation.

A remote sensing system is capable of providing detailed information on diffusion and dispersion of tracer dyes in surface waters. This information provides a basis for quantitatively evaluating the environmental effects of waste discharges and also provides data needed to evaluate the impact of proposed developments. The basic data collection system is a dual-channel optical mechanical scanner which is operated from a light aircraft. Data are collected at a rate greater than 70,000 measurements per second and is recorded directly on magnetic tape which is input to a computer system for analysis. Output is obtained as isoconcentration plots produced directly by the computer or the data can be recorded on digital tape, paper tape, or computer cards for subsequent computer analysis. Data produced with this system provide more detailed information than is obtainable with other systems used to monitor tracer dye movement. (Knapp-USGS)
W73-03943

THE REMOTE SENSING OF OIL SLICKS,

Naval Research Lab., Washington, D.C.

For primary bibliographic entry see Field 05B.

W73-03944

OIL SLICK STUDIES USING PHOTOGRAPHIC AND MULTISPECTRAL SCANNER DATA,

Virginia Inst. of Marine Science, Gloucester Point.

For primary bibliographic entry see Field 05B.

W73-03945

MULTI-SENSOR OIL SPILL DETECTION,

Spectran, Inc., Los Angeles, Calif.

For primary bibliographic entry see Field 05B.

W73-03946

REMOTE SENSING CONSIDERATIONS FOR WATER QUALITY MONITORING,

Wisconsin Univ., Madison.

For primary bibliographic entry see Field 05B.

W73-03947

A TECHNIQUE FOR THE COMPARISON OF CONTACT AND NON-CONTACT MEASUREMENTS OF WATER SURFACE TEMPERATURE,

Rensselaer Polytechnic Inst., Troy, N.Y.

E. F. C. Somerscales.

In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol II, p 1089-1093, 1971. 7 ref.

Descriptors: *Remote sensing, *Water temperature, *Air-water interfaces, *Infrared radiation, Winds, Evaporation, Thermometers, Instrumentation, Data collections.

Experimental measurements of the water and air temperature profiles in the vicinity of the surface of a body of water located in a small laboratory wind tunnel are described. The measurements are made by rapidly plunging a fine wire thermocouple into the water. The thermocouple measurements are compared with measurements made simultaneously by an infrared thermometer which is sighted on the water surface at the point where the thermocouple enters the water. This technique allows any difference in the temperatures measured by the infrared thermometer and the thermocouple to be evaluated in terms of the wind speed, air and water temperatures, humidity and irradiation. The IRT temperatures decrease as the wind speed increases. The difference between the IRT measurement and the bulk water temperature decreases as the wind speed and, hence, the temperature gradient in the water increases. (Knapp-USGS)
W73-03948

THERMAL SCANNER OBSERVATIONS OVER LAKE ONTARIO,

Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.

F. C. Elder, and K. P. B. Thomson.

In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol II, p 1095-1107, 1971. 8 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, *Water temperature, *Water circulation, *Lake Ontario, *Infrared radiation, Surveys, Data collections, Currents (Water), Canada, Instrumentation.

Infrared imagery in the 8-12 micron atmospheric window was obtained over Lake Ontario. The scanner was in operation for a total of 4 days, 2 in May, and 2 in July. A number of flights were taken on each day in order to provide a temporal comparison of the dominant thermal features on the lake surface. Most of the imagery was taken at an altitude of 3,000 feet. However, some of the overflights were at flight altitudes of 6 and 12 thousand feet. The overflights were planned to coincide with a thermal study off Oshawa. Hence, ground truth in the form of lake surface temperatures and meteorological measurements was available from ships in the area. Ground truth was also provided by a radiometer, which was flown in the aircraft at the same time as the scanner. The most striking feature of the composite photographs is the complexity of the thermal structure. For example, the coastal upwelling which was evident on July 16th is overlaid with a complex structure extending across the upwelling zone. A small-scale cellular structure is confined to the area of maximum density water. The persistence of a number of thermal features is an indication that they are part of a large scale lake circulation. (Knapp-USGS)
W73-03949

MICROWAVE EMISSION FROM SNOW-A PROGRESS REPORT,

Geological Survey, Tacoma, Wash.

M. F. Meier, and A. T. Edgerton.

In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor,

Michigan University Willow Run Laboratories Report No 10259-1-X, Vol II, p 1135-1163, 1971. 6 fig.

Descriptors: *Remote sensing, Snowpacks, *Microwaves, *Instrumentation, *Analytical techniques, Data collections, Numerical analysis, Correlation analysis, Aircraft, Snow surveys, Water equivalent, Depth, Temperature, Wavelengths.

Identifiers: *Microwave emission from snow, Ellipsometer.

Measurement of natural and artificial snowpacks at 21, 6, 2.2, and 0.8 cm wavelengths shows that brightness temperatures vary with snow depth, water equivalent, free water content, and with the character of the underlying material. A direct relationship exists between the water equivalent of dry snow and the microwave brightness temperature. Laboratory measurements of electrical properties of snow were used to develop numerical models of microwave emission properties as a function of snow depth, wetness, density, layering, and base material using Sogryn's layered medium theory. Numerical results agree well with field results for wet snow but the agreement is only qualitative for dry snow. (Woodard-USGS)
W73-03950

DETERMINATION OF SEA ICE DRIFT USING SIDE-LOOKING AIRBORNE RADAR,

Coast Guard, Washington, D.C. Office of Research and Development.

J. D. Johnson, and L. D. Farmer.

In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol III, p 2155-2168, 1971. 5 fig, 2 tab, 12 ref.

Descriptors: *Remote sensing, *Radar, *Sea ice, *Mapping, Instrumentation, Surveys, Monitoring, Navigation, Arctic, Currents (Water), Winds, Data collections, Topography.

Side-Looking Airborne Radar (SLAR) was used experimentally to map sea ice conditions. In conjunction with the MANHATTAN tanker test, the U.S. Coast Guard equipped a C-130 aircraft with a Philco-Ford AN/DPD-2 Side-Looking Radar and conducted ice-mapping experiments in the Northwest Passage during September 1969. In addition to observing the overall ice conditions, individual ice floes were identified on SLAR imagery by their size, shape, and surface characteristics. Single ice floes as well as general ice masses could be tracked to an accuracy of nearly one nautical mile. Also, water currents appear to have dominant long term influence on ice drift in this area. Using measures of the wind stress, Coriolis force, and pressure gradient force, approximate values of the surface ocean currents in the vicinity of a given floe may be calculated. (Knapp-USGS)
W73-03951

RELATION BETWEEN ENERGY AND ERROR DUE TO NUCLEAR STATISTICS FOR DENSITY MEASUREMENT BY GAMMA RAY TRANSMISSION,

Negev Inst. for Arid Zone Research, Beersheba (Israel).

For primary bibliographic entry see Field 08D.

W73-03964

RAPID MEASUREMENT OF HYDRAULIC CONDUCTIVITY CHANGES IN SLOWLY PERMEABLE SOILS,

Agricultural Research Service, Fresno, Calif.

For primary bibliographic entry see Field 02G.

W73-03968

Field 07—RESOURCES DATA

Group 7B—Data Acquisition

MEASUREMENT OF UNSATURATED CONDUCTIVITY AND DIFFUSIVITY BY INFILTRATION THROUGH AN IMPEDING LAYER,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 02G.
W73-03971

AIR PERMEABILITY AS RELATED TO PARTICLE SIZE AND BULK DENSITY IN SAND SYSTEM,
Alexandria Univ. (Egypt).
For primary bibliographic entry see Field 02G.
W73-03972

ON-SITE DIGITAL ACCUMULATION AND STORAGE OF HYDROLOGIC DATA FOR USE IN DATA ACQUISITION SYSTEMS,
For primary bibliographic entry see Field 07C.
W73-04067

MIXING-HEIGHT MEASUREMENT BY LIDAR, PARTICLE COUNTER, AND RAWINSONDE IN THE WILLAMETTE VALLEY, OREGON,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 03B.
W73-04102

WAVE CLIMATE STUDY: GREAT LAKES AND GULF OF ST. LAWRENCE—VOLUME II, APPENDICES A, B, AND C,
National Research Council of Canada, Ottawa (Ontario).
For primary bibliographic entry see Field 02H.
W73-04103

FIELD MEASUREMENT OF SOIL WATER POTENTIAL WITH THERMOCOUPLE PSYCHROMETERS,
Agricultural Research Service, Riverside, Calif. Salinity Lab.
For primary bibliographic entry see Field 02G.
W73-04105

AN ELECTRONIC DETECTOR SYSTEM FOR RECOVERING INTERNALLY TAGGED MENHADEN, GENUS BREVOORTIA,
National Marine Fisheries Service, Beaufort, N.C. Atlantic Estuarine Fisheries Center.
R. O. Parker, Jr.
Nat'l Ocean Atmosp Adm Tech Rep NMFS (Nat'l Mar Fish Serv) SSFR (Spec Sci Rep Fish), 654, p 1-7, 1972, Illus.
Identifiers: Brevoortia, *Electronic detectors, *Menhaden, *Tagged fish.

Operation and results are described of an electronic detector-recovery system for fish with internal ferromagnetic tags. Date and location of recapture can be obtained since tagged fish are detected and recovered as they are landed. Growth rates of 3.1 and 7.2 mm/mo. were obtained for 2 menhaden out of 130 and 483 days. Scale analyses supported annulus formation assumption. The best location for tag injection in adult menhaden appears to be about 13 mm above and just forward of the origin of the pelvic fin. Tag incisions were healed in 85% of the fish recaptured after 10 days.—Copyright 1972, Biological Abstracts, Inc.
W73-04174

NEW, DIRECTLY DIGITAL AUTOMATIC TITRATION APPARATUS,
Indiana Univ., Bloomington. Dept. of Chemistry. G. M. Hietje, and B. M. Mandarano. Analytical Chemistry, Vol 44, No 9, p 1616-1621, August 1972. 3 fig, 4 tab, 22 ref.

Descriptors: *Automatic control, *Automation, *Volumetric analysis, *Electronic equipment,

Chemical analysis, Instrumentation, Computers, Laboratory equipment, Drops (Fluids), Size, Aqueous solutions. Identifiers: Digital control, Potentiometry, Precision.

In this new system the titrant is delivered in the form of uniform submicroliter droplets whose production rate is controlled by an electronic digital pulse train. Titrant delivery rate is determined by measurement of the pulse frequency while the total titrant volume is related to the cumulative pulse count. A digital control system can be used to adjust titrant delivery for end-point anticipation or for titrations involving slow reactants. Data are presented for use of this system in several simple acid-base titrations using derivative potentiometric end-point detection. This system has only one moving part, the piezoelectric bimorph strip, which almost never needs to be replaced. All other components are electronic. Extension of this semi-automatic system to fully automated or computer-controlled laboratory situations is discussed. (Pestel-Battelle)
W73-04252

PERFORMANCE OF A FROST-TUBE FOR DETERMINATION OF SOIL FREEZING AND THAWING DEPTHS,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. Rickard, and J. Brown.
Soil Sci. Vol 113, No 2, p 149-154. 1972. Illus.
Identifiers: *Soil investigation, Depths, Freezing, *Frost tube, Performance, Soils, Thawing, On-site investigations.

Results of laboratory and field tests performed with a simple, accurate device for visually determining the depth of the 0 deg C isotherm in soil freezing and thawing are presented. The instrument is capable of providing reproducible readings that compare favorably with more sophisticated methods of measurement and can be fabricated in the field. The construction and potential uses of the frost tube are given.—Copyright 1972, Biological Abstracts, Inc.
W73-04254

NEW SENSORS FOR THE AUTOMATIC SORTING OF MUNICIPAL SOLID WASTE,
Massachusetts Inst. of Tech., Cambridge.
For primary bibliographic entry see Field 05D.
W73-04279

LICHENOMETRIC INDICATION OF THE TIME OF EXPOSURE OF A ROCK SUBSTRATE, (IN RUSSIAN),
Akademiya Nauk Estonskoi SSSR, Tallinn. Tallinn Botanical Garden.
Y. L. Martin.
Ekologiya, Vol 1, No 5, p 16-24. 1970.
Identifiers: Climate, Dendro chronology, Exposure, Glaciation, *Lichens, *Rock substrate, Time, *Weathering (Rocks).

Rock surfaces are exposed under the effect of various factors. In almost all cases they begin to be overgrown by plants, particularly by lichens. Thus lichenometry can be used for determining changes of sea level, the level of lakes, river floods, dynamics of firm basins, landslides, and talus, weathering processes, human activity (historical aspect), climatic changes in time and space, dynamics of glaciers, and glaciation. All this is especially effective when it is not possible to use any other methods of phytoclimatology, particularly dendrochronology. The combined use of dendrochronology and lichenometry gives more complete information on climatic changes in the past and on the history of glaciation of highlands.—Copyright 1972, Biological Abstracts, Inc.
W73-04334

MEASUREMENTS OF SEA SURFACE TEMPERATURE ON THE EASTERN PACIFIC CONTINENTAL SHELF USING AIRBORNE INFRARED RADIOMETRY, AUGUST 1963 - JULY 1968,
National Marine Fisheries Service, Tiburon, Calif. Tiburon Marine Lab.

J. L. Squire, Jr.
Available from the National Technical Information Service as PB-208 156, \$3.00 in paper copy, \$0.95 in microfiche. United States Coast Guard Oceanographic Report No 47, Washington, D.C., December 1971. 229 p, 221 fig, 24 ref.

Descriptors: *Oceans, *Temperature, *Pacific coast region, *Remote sensing, Isotherms, Weather data, Meteorology, Continental shelf, Fish, Migration, Solar radiation, Instrumentation. Identifiers: Infrared radiometry.

Airborne surveys were conducted monthly from August 1963 through July 1968, using an infrared radiometer to measure sea surface temperatures and to develop isotherm charts depicting temperature ranges for three areas of the eastern Pacific Continental Shelf. A total of 179 airborne surveys were conducted from aircraft made available by the U.S. Coast Guard as part of their commitment in support of the national oceanographic program. Sea surface temperatures determined by the monthly surveys are presented in contoured charts. Five-year mean sea surface temperatures for each of the three survey areas were determined for each calendar month of the year by 10-minute longitude by 10-minute latitude areas and isotherm charts were drawn from these data. The mean difference between 146 simultaneously observed airborne radiometer and surface bucket temperatures was 0.35F (radiometer lower). The standard deviation was 0.65F. (Eagle-Vanderbilt)
W73-04352

PHOTOGRAMMETRY AND HYDRAULIC SURFACES,
New Brunswick Univ., Fredericton.
W. Faig.

Journal of the Surveying and Mapping Division, American Society of Civil Engineers, Vol 98, No SU2, Paper 9337, p 145-156, November 1972. 7 fig, 2 tab, 16 ref.

Descriptors: *Photogrammetry, *Profiles, *Water levels, *Surfaces, *Air-water interfaces, Waves (Water).
Identifiers: *Water surfaces, Hydraulic surfaces.

Using photogrammetry, water surfaces can be determined without delay, because after photography the surface characteristics are stored in analog form and can be measured at any convenient time. There is also little limitation as far as point density is concerned. In the case of liquid surfaces, photogrammetry provides a measuring tool which does not require direct physical contact with the object and therefore does not cause disturbances. This is true for laboratory experiments as well as field measurements. Any photogrammetric camera can be utilized. However, if sufficient object space control is available and an analytical evaluation anticipated, nonmetric cameras are preferred due to their greater versatility and better economic feasibility. Solid rough surfaces can be measured by means of photogrammetry without difficulties. The simplest way to measure a flowing water surface photogrammetrically is the light and shadow approach. The only means of defining the surface with sufficient accuracy for stereophotogrammetric compilation is the utilization of fluorescent radiation. However, the fluorescein concentration has to be known and maintained throughout the experiment in order to perform the necessary reduction from measured to actual surface position. (Knapp-USGS)
W73-04368

RESOURCES DATA—Field 07

Evaluation, Processing and Publication—Group 7C

COMPARISON OF RECHARGE TO GROUND-WATER UNDER PASTURE AND FOREST USING ENVIRONMENTAL TRITIUM,
Commonwealth Scientific and Industrial Research Organization, Adelaide (Australia). Div. of Soils.
For primary bibliographic entry see Field 02F.
W73-04373

A SAMPLING SCHEME FOR SHALLOW SNOWPACKS,
Guelph Univ. (Ontario). School of Engineering.
W. T. Dickinson, and H. R. Whiteley.
International Association of Hydrological Sciences Bulletin, Vol 17, No 3, p 247-258, October 1972. 13 fig, 1 tab, 5 ref.

Descriptors: *Sampling, *Snowpacks, *Canada, *Variability, *Water equivalent, Density, Snow surveys, Snow cover, Runoff forecasting.
Identifiers: Ontario (Canada), *Shallow snowpacks.

For winter conditions in the Blue Springs Basin, Ontario, and for many other shallow snowpacks in Southern Ontario, snow depth is highly variable in time and space, necessitating the observation of a large number of points to adequately characterize the situation. In contrast to depth, snow density varies erratically but through a narrow range. The collection of relatively few density samples appears sufficient for the determination of water equivalent. A sampling scheme for the shallow snowpack of the Blue Springs Basin can be designed to involve the collection of numerous depth samples and relatively few density samples.
(Knapp-USGS)
W73-04386

RAMAN SPECTRA-STRUCTURE CORRELATION FOR PYRAZINES. NEW METHOD FOR OBTAINING SPECTRA OF TRAPPED NANO-LITER GAS CHROMATOGRAPH FRACTION,
Procter and Gamble Co., Cincinnati, Ohio. Miami Valley Labs.
For primary bibliographic entry see Field 05A.
W73-04388

LARGE, INEXPENSIVE OVEN USED TO DECONTAMINATE GLASSWARE FOR ENVIRONMENTAL PESTICIDE ANALYSIS,
Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
For primary bibliographic entry see Field 05A.
W73-04394

SOME COMMENTS ON THE SIGNAL-T-O-NOISE CHARACTERISTICS OF REAL PHOTOMULTIPLIER AND PHOTODIODE DETECTION SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
R. E. Santini.
Analytical Chemistry, Vol 44, No 9, p 1708-1709, August 1972. 1 tab, 6 ref.

Descriptors: Electrochemistry, Electrodes, Cathodes, Electronic equipment.
Identifiers: *Photomultiplier detector, *Photodiode detector, *Signal-noise ratios, Amplifiers, Photon counting, Dynodes, Photoelectric devices.

Comments are made on an earlier paper, which concluded that the photomultiplier (PMT) system possesses a definite signal-to-noise advantage over the photodiode system below about .00000009 amp photocathode current. These comments suggest that certain variables related to noise characteristics of the PMT were not considered and that the PMT-low gain amplifier combination is probably not as favorable as reported. Over prolonged periods, the PMT exhibits unavoidable, uncontrollable drifts, which are especially severe at

low anode currents. The PMT, however, is outstanding in photon counting applications where it can be utilized as a high-gain pulse amplifier. It is also suggested that in the applicable current range, the performance of either device is subject to many external empirical parameters, and system design is perhaps more important than the detector system itself. (Mortland-Battelle)
W73-04419

HIGH SENSITIVITY THERMOCHEMICAL ANALYSIS,
Georgia Univ., Athens. Dept. of Chemistry.
E. B. Smith, C. S. Barnes, and P. W. Carr.
Analytical Chemistry, Vol 44, No 9, p 1663-1669, August 1972. 6 fig, 1 tab, 20 ref.

Descriptors: *Temperature, *Aqueous solutions, Colorimetry, Water pollution, Electrical equipment, Volumetric analysis.

Identifiers: *Thermochemical analysis, Thermometric analysis, Precision, Amplifiers, Detection limits.

A lock-in amplifier and linear ramp generator system has been developed which permits an rms temperature resolution of 3-4 microdegrees C. This temperature resolution approximates the theoretical Johnson noise limit of the signal source. The system was employed to improve the sensitivity of thermometric analysis. In a 100-ml calorimetric vessel, solution of 15 micromolar perchloric acid have been titrated with sodium hydroxide with a precision and accuracy of better than 10 percent. This reaction generated 20 millocalories of heat and caused a temperature change of approximately 0.2 millidegrees C. At higher concentrations (1.5 micromolar) the optimum precision achieved was 0.2 percent which is the limiting precision of the volume delivery device.
(Byrd-Battelle)
W73-04420

USE OF NEW GLACIER INVESTIGATION TECHNIQUES IN ANTARCTICA (PRIMENIENI NOVYKH METODOV GLYATSILOGICHESKIH ISSLEDOVANIY V ANTARKTIDE),
Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-04509

LASER APPLICATIONS IN THE INVESTIGATION OF ICE-SHEET DYNAMICS (O VOZMOZHnosti ISPOL'ZOVANIYA LAZEROV Dlya ISSLEDOVANIYA DINAMIKI LED-NIKOVYKH POHROVOV),
Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-04510

APPLICATION OF LASERS TO INVESTIGATION OF GLACIER MOVEMENT (ISSLEDOVANIYE DINAMIKI DVIZHENIYA LED-NIKOVYKH POMOSHCH'YU LAZERA),
Arkticheskii i Antarkticheskii Nauchno-Issledovatel'skii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 02C.
W73-04518

7C. Evaluation, Processing and Publication

FLOOD FORECASTING IN THE UPPER MIDWEST - DATA ASSEMBLY AND PRELIMINARY ANALYSIS,
Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab.
For primary bibliographic entry see Field 04A.
W73-03906

NEBRASKA DROUGHTS: A STUDY OF THEIR PAST CHRONOLOGICAL AND SPATIAL EXTENT WITH IMPLICATIONS FOR THE FUTURE,
Nebraska Univ., Lincoln. Dept. of Geography.
For primary bibliographic entry see Field 02B.
W73-03907

STREAMFLOW ROUTING (WITH APPLICATIONS TO NORTH CAROLINA RIVERS),
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 04A.
W73-03908

GAZETTEER OF NATURAL DRAINAGE AREAS OF STREAMS AND WATER BODIES WITHIN THE STATE OF CONNECTICUT,
Geological Survey, Hartford, Conn.
M. P. Thomas.
Connecticut Department of Environmental Protection Bulletin No 1, 1972. 89 p, 2 fig. Price: \$1.00.

Descriptors: *Drainage area, *Streams, *Connecticut, Documentation, *Hydrologic data, Watersheds (Basins), Indexing.

A table of drainage areas above selected points on streams in Connecticut was prepared from U.S. Geological Survey 1/2-minute topographic quadrangle maps at a scale of 1:24,000 (one inch equals 2,000 feet). Drainage areas were determined for almost all significant points on streams, including mouths of tributaries, railroad and highway bridges, outlets of water bodies, and sites where partial or complete records of quantity and/or quality of streamflow are available. Locations above which drainage areas are given are described by geographic features easily identifiable on topographic maps. Indexes of the names of brooks, coves, dams, harbors, lakes, ponds, reservoirs, rivers, and towns and cities are included.
(Woodard-USGS)
W73-03914

SHEET FLOW UNDER SIMULATED RAINFALL,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02B.
W73-03921

QUALITY OF SURFACE WATERS OF THE UNITED STATES, 1967: PARTS 9-11. COLORADO RIVER BASIN TO PACIFIC SLOPE BASINS IN CALIFORNIA,
Geological Survey, Washington, D.C.

Available from GPO, Washington, DC 20402 - Price \$3.00 (paper cover). Geological Survey Water-Supply Paper 2015, 1972. 702 p, 2 fig, 32 ref.

Descriptors: *Water quality, *Chemical analysis, *Surface waters, *Colorado River basin, *Pacific coast region, California, Arizona, Colorado, Idaho, Nevada, New Mexico, Utah, Wyoming, Water temperature, Sediment transport, Suspended load, Water analysis, Inorganic compounds, Organic compounds, Biological properties, Water chemistry, Streams, Basic data collections, *Southwest US.
Identifiers: *Pacific Slope basins (Calif).

During the water year ending September 30, 1967, the U.S. Geological Survey maintained 272 stations on 179 streams for study of chemical and physical characteristics of surface water for the Colorado River basin to the Pacific Slope basins in California. The area includes all of Arizona and California; most of Nevada and Utah; and parts of Colorado, Idaho, New Mexico, and Wyoming. Samples were collected daily and monthly at 125 of these locations for chemical-quality analysis. Samples also were collected less frequently at

Field 07—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

many other points. Water temperatures were measured continuously at 119 and daily at 78 stations. At chemical-quality stations where data are continuously recorded at the stream site (monitors), the records consist of daily maximum, minimum, and mean values for each constituent measured. Quantities of suspended sediment are reported for 90 stations. Sediment samples were collected one or more times daily at most stations, depending on the rate of flow and changes in stage of the stream. Particle-size distributions of sediments were determined at 83 stations. (Woodard-USGS)
W73-03924

HYDROGRAPHIC OBSERVATIONS IN TAMPA BAY, FLORIDA—1969.
National Marine Fisheries Service, St. Petersburg Beach, Fla. Gulf Coast Fisheries Center.
For primary bibliographic entry see Field 05A.
W73-03926

FINITE-ELEMENT STRESS ANALYSIS OF AVALANCHE SNOWPACKS,
Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
For primary bibliographic entry see Field 02C.
W73-03928

AN EXPERIMENTAL MODEL FOR AUTOMATED DETECTION, MEASUREMENT AND QUALITY CONTROL OF SEA-SURFACE TEMPERATURES FROM ITOS-IR DATA,
National Environmental Satellite Service, Washington, D.C.
J. Leese, W. Pichel, B. Goddard, and R. Brower.
In: Proceedings of the 7th International Symposium on Remote Sensing of Environment, May 17-21, 1971, Michigan University: Ann Arbor, Michigan University Willow Run Laboratories Report No 10259-1-X, Vol I, p 625-646, 1971. 10 fig, 5 tab, 11 ref.

Descriptors: *Remote sensing, *Water temperature, *Infrared radiation, *Satellites (Artificial), Mathematical models, Data processing, Weather forecasting, Data collections.

A computer model was developed which contains all the segments of an automated operational procedure for obtaining sea-surface temperatures from satellite infrared (IR) data. An evaluation of this model during a five-week test period demonstrated the ability of the different software components to perform the detection, measurement, and quality control functions in the automated processing of raw data into sea-surface temperature values. Limitations in available ground truth data preclude the computation of accuracy based only on test comparisons of satellite temperatures and surface-based observations. A quantitative error analysis of the Improved TIROS Operational Satellite (ITOS) system components combined with test results on the model using real data indicates that an RMS variation of less than 1 deg C in derived sea-surface temperatures should be possible using only IR data in regions where the temperature gradient is less than 2 deg C per 100 km. In regions where the temperature gradients are 2 to 4 deg C per 100 km the inclusion of data from the visible channel to reduce cloud should reduce the RMS variation to less than 1 deg C. (Woodard-USGS)
W73-03940

A METHOD FOR CALCULATING WATER DEPTH, ATTENUATION COEFFICIENTS AND BOTTOM REFLECTANCE CHARACTERISTICS,
Michigan Univ., Ann Arbor.
For primary bibliographic entry see Field 07B.
W73-03941

SEA SURFACE TEMPERATURE MAPPING OFF THE EASTERN UNITED STATES USING NASA'S ITOS SATELLITE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 07B.
W73-03942

SURFACE WATER MOVEMENT STUDIES UTILIZING A TRACER DYE IMAGING SYSTEM,
 Battelle Memorial Inst., Richland, Wash. Pacific Northwest Labs.
For primary bibliographic entry see Field 07B.
W73-03943

MULTI-SENSOR OIL SPILL DETECTION,
Spectran, Inc., Los Angeles, Calif.
For primary bibliographic entry see Field 05B.
W73-03946

REMOTE SENSING CONSIDERATIONS FOR WATER QUALITY MONITORING,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 05B.
W73-03947

CONTRIBUTION TO METHODS OF APPLIED INVESTIGATIONS OF SOIL EROSION ON THE RIGHT BANK OF THE VOLGA IN THE GORKI REGION, (IN RUSSIAN).
For primary bibliographic entry see Field 02J.
W73-04053

DATA RECORD FOR PUBLIC ATTITUDES TOWARD REUSE OF RECLAIMED WATER,
California Univ., Los Angeles. Water Resources Center.
For primary bibliographic entry see Field 06B.
W73-04059

SELECTION OF TEST VARIABLE FOR MINIMAL TIME DETECTION OF BASIN RESPONSE TO NATURAL OR INDUCED CHANGES,
Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 04A.
W73-04061

STOCHASTIC ANALYSIS OF MONTHLY FLOW DATA APPLICATION TO LOWER OHIO RIVER TRIBUTARIES,
Purdue Univ., Lafayette, Ind. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W73-04063

ON-SITE DIGITAL ACCUMULATION AND STORAGE OF HYDROLOGIC DATA FOR USE IN DATA ACQUISITION SYSTEMS,
D. G. Chadwick.

Available from the National Technical Information Service as PB-214 185, \$3.00 in paper copy, \$0.95 in microfiche. Final report, PRCWRR21-1, June 1972. 25 p, 21 fig, 3 ref. OWRR A-011 Utah (1).

Descriptors: *Hydrologic data, Telemetry, Data collections, Measurement, *On-site data collections, Weather data.
Identifiers: Transducers.

Methods are discussed for measuring wind, water, and temperature, and recording the information in digital form at some given location remote from conventional 110 volt power source. Measurements of wind direction, wind miles, water level, rain fall, temperature, and the happening of

miscellaneous events can all be recorded on standard 8-hole paper tape. The system is operable for several months, unattended. The data are recorded at precise predetermined intervals. Dry cell batteries supply the necessary power to operate the system.
W73-04067

A DYNAMIC PROGRAMMING STUDY OF VARIOUS DIVERSION LOSSES,
Washington State Water Research Center, Pullman.
For primary bibliographic entry see Field 04A.
W73-04068

AN INVENTORY OF THE PONDS, LAKES AND RESERVOIRS OF MASSACHUSETTS, BERKSHIRE AND FRANKLIN COUNTIES,
Massachusetts Univ., Amherst. Water Resources Research Center.
For primary bibliographic entry see Field 02H.
W73-04069

A RECONNAISSANCE OF THE WINYAH BAY ESTUARINE ZONE, SOUTH CAROLINA,
Geological Survey, Columbia, S.C.
F. A. Johnson.
South Carolina Water Resources Commission Report No 4, 1972. 36 p, 11 fig, 9 tab, 9 ref.

Descriptors: *Saline water intrusion, *Estuaries, *South Carolina, *Tidal effects, *Runoff, Data collections, Streamflow, Salinity, Specific conductivity, Saline water-freshwater interfaces, Measurement, Chemical analysis.

Identifiers: *Winyah Bay (SC), *Black River Estuary (SC), Pee Dee River Estuary (SC).

The Winyah Bay (South Carolina) estuarine zone study made from December 1969 to May 1971 consists of Winyah Bay, the Black River estuary, the Pee Dee River estuary and the Waccamaw River estuary. The specific conductance of the Winyah Bay estuarine zone is related to tides and freshwater inflow. A specific conductance of 800 micromhos has been set as the boundary or interface between fresh and salt water. The fresh water upstream from the salt-water interface is of suitable chemical quality for most purposes. The location of the salt-water interface normally varies about 4 miles between high and low tides. At high tide during periods when fresh-water inflow is 3000 cfs or less, the front moves about 16 miles upstream from mile 0.0 of the Waccamaw and Pee Dee Rivers. The interface penetrates to about 5 miles above mile 0.0 of those rivers under average conditions of fresh-water inflow (15,000 cfs) and tide. (Woodard-USGS)
W73-04095

BATHYMETRIC RECONNAISSANCE OF MARLETTE AND SPOONER LAKES, WASHOE COUNTY AND CARSON CITY, NEVADA,
Geological Survey, Carson City, Nev.
F. E. Rush, B. R. Scott, P. A. Glancy, T. L. Katzer, and E. P. Ament.

Nevada Division of Water Resources, Water Resources—Information Series Report 14, 1972. 1 sheet, 3 fig.

Descriptors: *Bathymetry, *Hydrologic data, *Water level fluctuations, *Lakes, *Nevada, Lake morphology, Lake morphometry, Impoundments, Inflow, Water storage, Depth, Measurement, Data collections, Maps, Curves.
Identifiers: *Marlette Lake (Nev), *Spooner Lake (Nev).

Maps, curves, and tables describe bathymetric data for Marlette and Spawner Lakes between Carson City and Lake Tahoe in the Carson range of the Sierra Nevada. Marlette Lake is at an altitude of 7,838 feet and Spawner Lake, at about 6,980

RESOURCES DATA—Field 07

Evaluation, Processing and Publication—Group 7C

feet. Marlette Lake is about 1,600 feet higher than Lake Tahoe and about 3,200 feet higher than Carson City. Both lakes drain to Lake Tahoe. The principal source of water for the lakes is snowmelt. The Marlette Lake basin has an area of 3.6 square miles and Spooner Lake basin, about 1.2 square miles. Precipitation at Marlette and Spooner Lakes averages about 27 inches per year, or an average annual total of each basin of about 4,500 acre-feet and 1,700 acre-feet, respectively. Of these amounts, an estimated 60% runs off to the lakes. A continuously recording, electronic fathometer was used to measure the depths of Marlette and Spooner Lakes, making a total of 19 traverses on Marlette Lake and 17 on Spooner Lake. (Woodard-USGS)
W73-04100

A REPORT ON THE PROTOTYPE DATA COLLECTED IN THE POTOMAC RIVER FOR THE CHESAPEAKE BAY MODEL STUDY, Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 02L.
W73-04101

LARGE POWER PLANT EFFLUENT STUDY (LAPPS) VOLUME 3 - INSTRUMENTATION, PROCEDURES, AND DATA TABULATIONS (1970), Environmental Protection Agency, Research Triangle Park, N.C. Div. of Meteorology.
For primary bibliographic entry see Field 05A.
W73-04121

THE POSSIBILITY OF OBJECTIVE CONTROL OF SOIL MOISTURE DATA (IN RUSSIAN), For primary bibliographic entry see Field 02G.
W73-04180

BATHYMETRIC RECONNAISSANCE OF TOPAZ LAKE, NEVADA AND CALIFORNIA, Geological Survey, Carson City, Nev.
F. E. Rush, and V. R. Hill.
Nevada Division of Water Resources, Water Resources—Information Series Report 12, 1972, 1 sheet, 4 fig, 1 tab.

Descriptors: *Bathymetry, *Lakes, *Nevada, *California, *Hydrologic data, Water level fluctuations, Depth, Lake morphology, Lake morphometry, Reservoirs, Water storage, Inflow, Reservoir releases, Irrigation, Data collections, Maps, Curves.
Identifiers: *Topaz Lake (Nev and Calif.).

Maps, curves and tables describe bathymetric data for Topaz Lake which is 36 miles south-southwest of Carson City, Nevada, on the California-Nevada State line. The valley in which the lake lies is a topographically closed basin, having an area of about 14 square miles. Under native conditions, a small lake named Alkali Lake occupied the central part of the valley floor. Beginning in 1921, water from the West Walker River was conveyed in a feeder canal across the low alluvial part of the divide to the basin, forming a storage reservoir. The enlarged body of water, which covered most of the valley floor, was renamed Topaz Lake. Stored water is released at the northeast end of the lake through a 1,200-foot long tunnel and a canal which conveys water back to the West Walker River. Downstream, the released water is used principally for irrigation. The lowest practical lake stage at which water can be released through the tunnel is 4,972.3 feet, which leaves 59 feet of lake depth as dead storage. Releasable storage prior to 1937 was about 45,000 acre-feet. (Woodard-USGS)
W73-04192

PENETRATION OF FREE-FALLING OBJECTS INTO DEEP-SEA SEDIMENTS, Naval Postgraduate School, Monterey, Calif.
For primary bibliographic entry see Field 02J.
W73-04193

COMPARISON OF MULTIPLE REGRESSION AND PRINCIPAL COMPONENT REGRESSION FOR PREDICTING WATER YIELDS IN KENTUCKY, Kentucky Univ., Lexington. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 04A.
W73-04199

ON THE TIME WHEN THE EXTREME FLOOD OCCURS, Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 02E.
W73-04210

GROUND-WATER LEVELS IN THE SOUTH PLATTE RIVER VALLEY OF COLORADO, 1968-72, Geological Survey, Denver, Colo.
R. T. Hurr, and R. R. Luckey.
Colorado Water Conservation Board Basic-Data Release No 26, 1972. 33 p, 3 fig, 1 tab.

Descriptors: *Groundwater, *Water levels, *Water wells, *Well data, *Colorado, Water utilization, Irrigation, Water level fluctuations, Aquifer characteristics, Groundwater recharge, Basic data collections, Measurement, Observation wells, Groundwater resources.
Identifiers: *South Platte River valley (Colo).

Water levels were measured for approximately 1,000 wells in November following the 1972 irrigation season in the South Platte River valley of Colorado. Measurements made each autumn during the 4 preceding years are included to serve as references illustrating declining or rising water levels. The valley extends from near Denver, Colo., to the Nebraska State line. The study area extends from Henderson, Colo., near Denver, to the State line, a distance of 190 miles, and occupies 1,000 square miles in parts of six counties. The valley-fill aquifer is adjacent to, underlies, and is in hydraulic connection with the South Platte River. This aquifer yields groundwater which is used as a supplemental supply for irrigation in the South Platte River valley. The valley fill ranges in thickness from 0 to about 300 feet; in much of the area, however, the thickness is about 50 to 200 feet. The valley fill consists of gravel, sand, silt, and clay of Pleistocene to Holocene ages. The valley fill ranges from 2 to 10 miles in width and rests in a broad trough cut into the bedrock. (Woodard-USGS)
W73-04211

BATHYMETRIC RECONNAISSANCE OF RYE PATCH RESERVOIR AND THE PITTS-TAYLOR RESERVOIRS, PERSHING COUNTY, NEVADA, Geological Survey, Carson City, Nev.
F. E. Rush, and B. L. Rice.
Nevada Division of Water Resources, Water Resources—Information Series Report 13, 1972, 1 sheet, 9 fig, 2 tab, 2 ref.

Descriptors: *Hydrologic data, *Bathymetry, *Water level fluctuations, *Reservoirs, *Nevada, Impoundment, Lake morphology, Lake morphometry, Data collections, Inflow, Reservoir releases, Irrigation, Water quality, Sedimentation, Water storage, Depth, Measurement, Water temperature, Maps, Curves.
Identifiers: *Rye Patch Reservoir (Nev), *Pitts-Taylor Reservoirs (Nev).

Maps, curves, graphs, and tables summarize hydrologic data for Rye Patch, Upper Pitt-Taylor, and Lower Pitt-Taylor Reservoirs which are located 110 miles northeast of Reno, Nev. The reservoirs are on the narrow alluvial floor of a north-trending segment of the Humboldt River basin at an altitude of about 4,100 feet. In 1909, work began on construction of the Pitt-Taylor Reservoirs. The design capacity of the reservoir system, to be used for power, irrigation, and domestic use, was 57,000 acre-feet. Rye Patch Dam construction was begun in 1935 and was completed and water impoundment begun in the following year. The design capacity is 190,000 acre-feet when 12-inch flashboards are in place on top of the spillway gates. The quality of water released from Rye Patch Reservoir is summarized. The primary constituents are sodium and bicarbonate. A continuously recording, electronic fathometer was used to measure water depth on 80 traverses of the reservoirs in June 1971. Between 15,000 and 20,000 acre-feet of sediment was deposited in Rye Patch Reservoir during the period 1936-71. (Woodard-USGS)
W73-04227

COMPUTER-AIDED VISUAL SPECTRUM ANALYSIS, Waterloo Univ. (Ontario). Dept. of Chemistry.
For primary bibliographic entry see Field 05A.
W73-04234

SURVEY OF ANALYTICAL SPECTRAL DATA SOURCES AND RELATED DATA COMPIRATION ACTIVITIES, National Bureau of Standards, Washington, D.C., Office of Standard Reference Data.
For primary bibliographic entry see Field 05A.
W73-04244

COMBINED USE OF OPTIMIZATION AND SIMULATION MODELS IN RIVER BASIN PLANNING, John F. Kennedy School of Government, Cambridge, Mass.
For primary bibliographic entry see Field 06A.
W73-04275

OPPORTUNITY COSTS OF A TRANSBASIN DIVERSION OF WATER I. METHODOLOGY, Hawaii Univ., Honolulu. Dept. of Economics; and Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 04A.
W73-04276

FALLOUT PROGRAM. QUARTERLY SUMMARY REPORT, JUNE 1, 1972 THROUGH SEPT. 1, 1972, New York Operations Office (AEC), N.Y. Health and Safety Lab.
For primary bibliographic entry see Field 05B.
W73-04315

FALLOUT PROGRAM QUARTERLY SUMMARY REPORT JUNE 1, 1972 - SEPTEMBER 1, 1972 - AN APPENDIX, New York Operations Office (AEC), N.Y. Health and Safety Lab.
For primary bibliographic entry see Field 05B.
W73-04316

LITERATURE SEARCH FOR ATMOSPHERIC HUMIDITY PROFILE MODELS FROM THE SEA SURFACE TO 1,000 METERS, National Oceanographic Data Center, Rockville, Md.
K. R. Avery.
NOAA Technical Memorandum EDS NODC-1, February 1972. 32 p, 14 fig, 4 tab, 55 ref.

Field 07—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

Descriptors: *Reviews, *Atmosphere, *Humidity, *Temperature, *Measurement, Oceans, Remote sensing, Mathematical studies, Winds, Meteorology.

A search of the literature published before 1970 was made to find temperature-humidity profiles from the sea surface to the 1,000 meter level in order to derive atmospheric corrections for low-level airborne infrared (8 micro to 13 micro) sea surface temperature measurements. There are no substantiated, globally applicable, models for the first 1,000 meters from the results of previous measurements. (The primary emphasis of most research studies has been on the 10-meter microscale boundary layers.) This investigation shows that future work should be directed toward deducing suitable low level atmospheric profile equations by a study of available ship weather data together with a detailed analysis of ocean weather ship radiosonde soundings (sea surface up to 1,000 meters), or by airborne experiments designed to derive a method for computing environmental corrections for radiometric measurement of sea surface temperature using flight-level measurement of air temperature and humidity. (Eagle-Vanderbilt)
W73-04332

USE OF SURFACE OBSERVATIONS IN BOUNDARY-LAYER ANALYSIS,
National Weather Service, Silver Spring, Md.
H. M. Mogil, and W. D. Bonner.
NOAA Technical Memorandum, NWS TDL-44, March 1972. 16 p, 1 fig, 8 tab, 10 ref.

Descriptors: *Boundary layers, *Radiosondes, *Temperature, *Humidity, Meteorology, Weather data, Surface waters, Mathematical studies, Dew point.

Methods of objective analysis have been developed that use surface reports to enhance the resolution of radiosonde data. Experiments performed compare the accuracy of two such methods with the accuracy obtained from direct analysis of radiosonde data. One method related layer-mean quantities to surface values by analysis of ratios; the other relates point values aloft to surface values by analysis of lapse rates. Parameters examined include mean potential temperature and mean mixing ratio within layers extending from the surface to 50 and 100 mb above the ground and temperature and mixing ratio at specific pressure levels to 200 mb above the ground. Results show that the use of surface data reduces the errors in analysis of temperature and moisture at 0000 but not at 1200 GMT. The improvement in error reduction decreases with height and is significant only within the lowest 150 mb. Reduction of error is greater for moisture than for temperature. Methods using surface data appear to be valuable only during that portion of the day when surface and lower troposphere temperature or moisture are highly correlated as a result of vertical mixing. (Eagle-Vanderbilt)
W73-04333

MEASUREMENTS OF SEA SURFACE TEMPERATURE ON THE EASTERN PACIFIC CONTINENTAL SHELF USING AIRBORNE INFRARED RADIOMETRY, AUGUST 1963 - JULY 1968,
National Marine Fisheries Service, Tiburon, Calif.
Tiburon Marine Lab.
For primary bibliographic entry see Field 07B.
W73-04352

FLEXIBLE PRICING IN WATER SUPPLY PLANNING—FOR FLEXIBLE ENGINEERS,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
For primary bibliographic entry see Field 06A.
W73-04354

PROPERTIES OF THE KERNELS FOR TIME INVARIANT, INITIALLY RELAXED, SECOND ORDER, SURFACE RUNOFF SYSTEMS,
For primary bibliographic entry see Field 02A.
W73-04371

USING CANONICAL CORRELATION FOR HYDROLOGICAL PREDICTIONS,
Forest Service (USDA), Glendora, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 02E.
W73-04381

SPATIAL ANALYSIS OF RAINFALL DATA FROM DENSE NETWORKS,
Hebreve Univ., Jerusalem (Israel).

D. Sharon.
International Association of Hydrological Sciences Bulletin, Vol 17, No 3, p 291-300, October 1972. 2 fig, 24 ref.

Descriptors: *Rain gages, *Networks, *Data collections, *Data processing, Depth-area-duration analysis, Correlation analysis, Variability, Reviews, Sampling, Rainfall disposition, Distribution patterns.

Daily rainfall data from dense networks, such as in basins being used for research, are commonly analyzed using standard statistical procedures. A short description of some techniques is given, along with some comments on these. When measures of the spatial average and the spatial variability are considered, a distinction is made between the requirements for their use in a descriptive way or in any statistical sense. Correlation analysis of rainfall data is dealt with particularly. Its use for obtaining a generalized quantitative assessment of the extent of 'spottiness' of rainfall is discussed. (Knapp-USGS)
W73-04383

CALCULATION OF AREAL RAINFALL USING FINITE ELEMENT TECHNIQUES WITH ALTITUDINAL CORRECTIONS,
P. Hutchinson and W. J. Waller.
International Association of Hydrological Sciences Bulletin, Vol 17, No 3, p 259-272, October 1972. 5 fig, 2 tab, 11 ref.

Descriptors: *Rain gages, *Data collections, *Finite element analysis, *Altitude, Networks, Sampling, Distribution patterns, Rainfall disposition, Slopes, Variability.

A procedure for calculating areal rainfall, based on recent innovations in finite element analysis, is presented. The procedure involves the use of interpolation functions, allowing an accurate representation of the shape and relief of the catchment, with numerical integration performed by Gaussian quadrature. Each rain gage is allotted two weights, one associated with the rainfall reduced to a datum, and the other with the rainfall-altitude relationship. This effectively removes any systematic errors due to altitudinal bias of the network. The rainfall-altitude relationship, derived for individual storms and for synoptic situations for a small area, is used to show that errors due to the bias of the network can be considerable. (Knapp-USGS)
W73-04385

MINIATURE ON-LINE DIGITAL COMPUTER FOR MULTIPURPOSE APPLICATIONS. APPLICATIONS TO KINETIC ANALYSES,
Purdue Univ., Lafayette, Ind. Dept. of Chemistry.
R. A. Parker, and H. L. Pardue.
Analytical Chemistry, Vol 44, No 9, p 1622-1628, August 1972. 1 fig, 4 tab, 13 ref.

Descriptors: *Digital computers, *Analytical techniques, Instrumentation, Kinetics, Electronic equipment, Sensitivity, Evaluation, Computers, Gas chromatography.

Identifiers: *Kinetic analysis, On-line computers, Atomic absorption spectrophotometry, Performance evaluation.

A miniature on-line digital (MOLD) computer employing stored programs and suitable for multipurpose use has been developed. It includes analog circuitry for preconditioning of analog signals and a memory bank for storing analytical data. Results are available as a numerical display in decimal format. Due to the low cost of the system, it is economically feasible to dedicate it to a single experiment. Since it involves little interfacing from one instrument to another, and since the operating program can be changed quickly, it can be applied to a variety of different problems. Atomic emission and absorption instrumentation can easily be interfaced and programmed to provide direct concentration readout. With minor modifications, GC integration with direct mass readout could be achieved. The MOLD computer was evaluated using electronically simulated kinetic response curves and single- and two-component analysis using first order reactions for inorganic and organic compounds. It was apparent that a limited number of mathematical operations could be performed and that a small percentage of accuracy and/or selecting was sacrificed; however, the benefits gained with fast, easily obtained results could outweigh these inadequacies. (Snyder-Battelle)
W73-04387

AUTOMATIC SORTING OF INFRARED SPECTRA,
National Biological Standards Lab., Canberra (Australia).
C. S. Rann.
Analytical Chemistry, Vol 44, No 9, p 1669-1672, August 1972. 3 fig, 1 tab, 3 ref.

Descriptors: *Automation, Electronic equipment, Data processing, Organic compounds, Computers, Pollutant identification, Computer programs, Instrumentation.

Identifiers: *Infrared spectra, *Sorting, Calculators, Teletype readers, Drugs.

With a calculator-teletype reader system for the automatic sorting of infrared spectra the operator is required to enter digits of the unknown spectrum into the calculator, load the tape into the teletype reader, and start the program. The program then runs unattended until the library tape has been processed. Any comparison spectrum with a figure of merit less than 5 would be printed out by the teletype, together with a reference number which enables the details of the compound and an infrared spectrum chart to be located in the main library of drug spectra. The system described greatly increases the facility of the techniques for identification of organic compounds using infrared spectra. (Byrd-Battelle)
W73-04413

ANALYTICAL TECHNIQUE MAY CUT OIL SPILLS,
Adcon Corp., Santa Barbara, Calif.
For primary bibliographic entry see Field 05G.
W73-04429

PRINCIPLE OF MAXIMUM ENTROPY IN HYDROLOGIC FREQUENCY ANALYSIS,
Lagos Univ. (Nigeria). Dept. of Civil Engineering.
J. O. Sonuga.
Journal of Hydrology, Vol 17, No 3, p 177-191, November 1972. 2 fig, 3 tab, 6 ref.

Descriptors: *Frequency analysis, *Statistical methods, *Probability, Data processing, Design flood, Variability, Streamflow forecasting, Runoff forecasting, Time series analysis, Distribution patterns.

ENGINEERING WORKS—Field 08

Structures—Group 8A

The principle of maximum entropy is used to develop a simplified but meaningful probability distribution of practical value in hydrologic frequency analysis, particularly in the area of scarce hydrologic data. The mean value and the standard deviation (or the coefficient of variation) are the only prior information required for the parameters of the distribution. The distribution is the minimally biased model consistent with the amount of information available. For ease of application, the parameters of the distribution were computed for various values of the coefficient of variation ranging from 0.740 to 0.150. From knowledge of the coefficient of variation of a given hydrologic series, the corresponding return period curve can be selected from given charts to make the desired evaluations. (Knapp-USGS) W73-04531

A HYDROLOGIC DESCRIPTION OF LAKE MAGDALENE NEAR TAMPA, FLORIDA,
Geological Survey, Tallahassee, Fla.
J. D. Hunn, and R. C. Reichenbaugh.

Florida Bureau of Geology Map Series No 49, 1972. 1 sheet, 4 fig, 1 map, 2 tab, 8 ref.

Descriptors: *Hydrologic data, *Lakes, *Florida, Lake morphology, *Water level fluctuations, Water quality, Sedimentation, Chemical analysis, Groundwater movement, Hydrology, Data collections, Maps, Hydrographs, Aquifers, Recreation facilities, Construction, Planning, Watershed management, Small watersheds.

Identifiers: *Lake Magdalene (Fla), Tampa (Fla).

This atlas describes the hydrologic and geologic setting of Lake Magdalene in Florida. The lake, about 1 1/2 miles north of Tampa, is used for fishing, swimming, and boating. Residential areas are replacing citrus groves that formerly surrounded the lake. Data collected during the investigation include: hydrologic and geologic information from test borings, altitude of land surface at test borings and selected ponds, water-level measurements in wells, and lake depth from 63 traverses with an echo sounder and check soundings. The field work was done in the period March-September 1971. Lake Magdalene has a surface area of 0.4 square mile at a stage of 47 feet above mean sea level and a drainage basin area of 1.7 square miles. The lake is hydraulically connected on all sides with a shallow aquifer that consists of silty fine to medium sand. Inflow to the lake is primarily from the shallow aquifer. Outflow from the lake occurs as lateral flow into the shallow aquifer to the northeast and southeast and as vertical seepage into the Floridian aquifer. The close relation between lake stage and rainfall is demonstrated. Sediment samples were collected from two sites in the lake. These samples contained dieldrin, chlordane, DDD, and DDE in measurable quantities. (Woodard-USGS) W73-04537

THE OHIO STATE UNIVERSITY VERSION OF THE STANFORD STREAMFLOW SIMULATION MODEL: PART I - TECHNICAL ASPECTS,
Ohio State Univ., Columbus. Dept. of Civil Engineering.

For primary bibliographic entry see Field 02A. W73-04542

THE OHIO STATE UNIVERSITY VERSION OF THE STANFORD STREAMFLOW SIMULATION MODEL: PART II - THE COMPUTER PROGRAM,
Ohio State Univ., Columbus. Dept. of Civil Engineering.

For primary bibliographic entry see Field 02A. W73-04543

THE OHIO STATE UNIVERSITY VERSION OF THE STANFORD STREAMFLOW SIMULATION MODEL: PART III - USER'S MANUAL,
Ohio State Univ., Columbus. Dept. of Civil Engineering.

For primary bibliographic entry see Field 02A. W73-04544

08. ENGINEERING WORKS

8A. Structures

TIDAL ENERGY FROM THE BAY OF FUNDY,
Bristol Univ. (England).
T. L. Shaw, and J. van den Heuvel.
Civil Engineering - ASCE, p. 40-42, December 1972. 4 fig.

Descriptors: *Tides, *Tidal energy, *Engineering structures, *Electric power production, Basins, Electric power, Estuaries, Pumping, Turbines, Costs, Pumped storage, Dikes, Reservoirs.

Identifiers: *Bay of Fundy, Off-peak power.

A plan for harnessing tidal energy for electric power production in high tidal estuaries such as the Bay of Fundy is presented. It involves construction of dikes and gates to form two basins closed off from the sea. For the greatest head difference and highest machine efficiency the second basin must be in deep water away from the coast. Power production and pumping equipment operation follows a daily cycle to utilize off-peak energy from an associated thermal plant. Rather than the conventional high head of pumped storage, this scheme employs low head and high discharge. Compared to single barrage, ebb-tide generation with remote high head pumped storage: fifty percent more plant is required in the estuary, but the high head pumped storage is eliminated; energy output is almost identical; the load factor of at least 40% applied to all plants is higher than with conventional methods; sluices are not required; land is not required; tide ranges are reduced; and flood dangers will be removed. (Eagle-Vanderbilt) W73-04041

BEHAVIOR OF KOYNA DAM--DEC. 11, 1967 EARTHQUAKE,
Roorkee Univ., (India).

For primary bibliographic entry see Field 08E. W73-04076

PLANNING CONCRETE DAM CONSTRUCTION CONTROL SURVEYS,
Bureau of Reclamation, Montrose, Colo.

M. J. Willis.
Journal of Surveying and Mapping Division, American Society of Civil Engineers, Vol. 98, No. SU1, p. 27-50, July 1972. 13 fig, 7 ref, append.

Descriptors: *Concrete dams, Bench marks, Terrain analysis, Construction, On-site investigations, Specifications, *Planning, Networks, *Surveys.

Identifiers: Morrow Point Dam (Colorado), Computer applications, First order surveys, Double-curvature arch dams, Reconnaissance surveys, Baselines, Survey stations, Triangulation nets, Plane surveying.

Ingenuity and resourcefulness in planning control surveys contribute greatly to the accuracy of information available to construction personnel. Controls for: construction of the high double-curvature concrete arch dam at Morrow Point, Colorado, are described. Planning included the phases of reconnaissance, site investigation, and preconstruction layouts to fit the features to rough terrain. Third-order triangulation networks were upgraded to first-order, and a first-order level net was accepted for extension to the construction site. Tolerances for concrete surfaces, embedded

materials, and mechanical equipment were studied to determine their influence on required accuracy of controls. To obtain a higher accuracy than may be needed is much more economical than to lower the accuracy and be plagued by results that do not meet specified tolerances and may require costly remedial work. The field work for triangulation, precise leveling, keyway layout, and the target reference system is described. Numerous field layouts illustrate details of all controls. (USBR) W73-04077

UPLIFT COMPUTATIONS FOR HOLLOW GRAVITY DAMS,
FENCO, Toronto (Ontario).
G. D. Ransford.

Houille Blanche, Vol 27, No 4, p 295-302, 1972. 3 fig, 2 tab, 3 ref, 2 append.

Descriptors: *Concrete dams, *Dam design, *Uplift pressure, *Computation, Gravity dams, Percolation, Drainage engineering, Seepage, Flow nets, Mathematical analysis, Drains.

Identifiers: *Hollow gravity dams.

Hollow gravity dams reduce uplift pressures from water percolating through or under the structure, because these openings serve as highly efficient, elongated drains. An uplift computation, based on the drainage theory, is presented. The formulas give the average uplift pressures required for designing any section of a hollow gravity dam. Assumptions are that: (1) seepage takes place horizontally, and (2) the real finite cavity in each dam block is a narrow slit. The mean uplift pressure varies linearly from the dam face to the head of the slit where the residual mean uplift is usually a small fraction of the full value at the upstream dam face. (USBR) W73-04083

FLOATABLE BREAKWATER ELEMENT,

B. Szyfter.
U. S. Patent No 3,673,805, 3 p, 19 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 900, No 1, p 60, July 4, 1972.

Descriptors: *Patents, *Breakwaters, *Beach erosion, *Shore protection, Piers, *Beaches, *Coasts, Erosion, Tidal effects, Equipment.

A pier element is provided whose body is formed as a collapsible shell of sheet material and has a source of compressed gas (air) for inflation. When inflated it has a prismatic elongate shape with a polygonal profile. The shell, when deflated, enfolds the anchor or anchors. It is initially held together by water-soluble ties. The package is held in a collapsed position by the ties, but when immersed the ties dissolve and the shell is automatically inflated by one or more compressed-air cartridges. (Sinha-OEIS) W73-04153

TYBEE ISLAND, GEORGIA; GALVESTON HARBOR, TEXAS.

For primary bibliographic entry see Field 06E. W73-04452

MURRELLS INLET, SOUTH CAROLINA; NORTHPORT HARBOR, WISCONSIN.

For primary bibliographic entry see Field 06E. W73-04453

A STUDY OF THE NEED FOR AND FEASIBILITY OF A PROGRAM FOR THE REMOVAL AND DISPOSAL OF DRIFT AND OTHER DERRISS, INCLUDING ABANDONED VESSELS, FROM THE PUBLIC HARBORS AND ASSOCIATED CHANNELS UNDER THE JU-

Field 08—ENGINEERING WORKS

Group 8A—Structures

RISDICTION OF THE DEPARTMENT OF THE ARMY.
Report of the Chief of Engineers to the Secretary of the Army, Printed for use of Comm. on Public Works, U.S. House of Representatives, 91st Sess (December 1970), 36 p, 19 photo, 3 tab, 4 append.

Descriptors: *Harbors, *Channel improvement, *Water pollution sources, Disposal, Water pollution, Navigation, Priorities, Driftwood, Wood wastes, Sanitary engineering, Flotsam, Fouling, Multiple-purpose project, Water policy, Transportation, Navigable waters, Legislation, Regulation, Water quality control, Water pollution control.
Identifiers: Corps of Engineers.

The Chief of Engineers has found that a serious navigation problem exists in many harbors and waterway areas. Large quantities of floating debris as well as derelict vessels present significant navigational safety hazards causing extreme economic losses each year. Furthermore, seaward of the mean high water line and on the adjacent land, there are abandoned and decaying structures and loose materials which are a source of drift and debris in our waterways. The Chief of Engineers Report concludes that strengthening existing administrative and legislative actions and new authority to regulate various sources of drift would be highly desirable along with a more aggressive program of removing sources of drift. The Office of the Secretary of Army, after reviewing the report, concluded that the need for federal participation in the proposed remedial measures is questionable; equity calls for owners of debris causing property to assume the cost of debris prevention, the additional authority to subsidize the removal of debris-causing structures is not required for the Corps to fulfill its traditional responsibilities and the proposal is of low priority when compared with authorized but uncompleted Corps projects. (Beardsley-Florida)
W73-04455

EAST FORK OF WHITEWATER RIVER, INDIANA AND OHIO (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Available from the National Technical Information Service as EIS-IN-724937-F, \$4.00 in paper copy, \$0.95 in microfiche. July 17, 1972. 40 p, 1 map, 4 tab.

Descriptors: *Environmental effects, *Flood protection, *Multiple-purpose projects, *Indiana, *Ohio, Land management, Reservoirs, Erosion, Sedimentation, Municipal water, Multiple-purpose reservoirs, Industrial water, Recreation, Groundwater, Flood plain zoning, Channel improvement, Flood damage, Structures, Erosion control, Sediment control.
Identifiers: *Whitewater River (Indiana and Ohio), *Environmental Impact Statements.

Project measures include land treatment practices and six multiple-purpose structures for flood protection, public recreation and municipal and industrial water supply on the East Fork of the Whitewater River in Indiana and Ohio. Also included in the project are stream environmental corridor development and multiple-purpose channel improvement. These measures will reduce erosion and sediment production by about 30 percent, flood damages by an average 42 percent and sediment damages by 48 percent. The project will provide adequate municipal and industrial water supplies to meet the demands for the next 50 years. Three lakes will provide recreational opportunities. The project will remove 3,364 acres from private agricultural uses. Alternatives considered but not recommended included flood plain zoning, floodwater retarding structures in the middle and lower reaches, ground water for municipal and industrial uses, and others. (Nielsen-Florida)
W73-04458

FRIE RIVER, THREE RIVERS, TEXAS; MISSISSIPPI RIVER AT WINONA, MINNESOTA; SURVEY RESOLUTIONS.
For primary bibliographic entry see Field 06G.
W73-04463

SAVANNAH RIVER BASIN INSPECTION.
For primary bibliographic entry see Field 06E.
W73-04472

GENESEE RIVER BASIN, NEW YORK AND PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Water Resources Council, Washington, D.C.

Available from the National Technical Information Service as EIS-NY-72-4894-F, \$3.75 in paper copy, \$0.95 in microfiche. July 10, 1972. 32 p.

Descriptors: *Environmental effects, *River basin development, *Flood control, *Water supply, River basins, Watershed management, Reservoirs, Dams, Recreation, Great Lakes Region, New York, Pennsylvania, River basin commissions, Floods, Flood forecasting, Flood plain zoning, Flood protection, Warning systems, Wildlife habitats, Channel improvements, Water management (Applied).
Identifiers: *Environmental Impact Statements, *Genesee River Basin (N.Y. and Pa.).

This action involves comprehensive planning to meet projected water and related land needs through the year 2020, in the Genesee River Basin. The plans for structural measures consisting of 16 upland reservoirs and two multiple-purpose projects on the Genesee River from Pennsylvania through New York to Lake Ontario. The reservoir projects would provide water for irrigation, fish and wildlife habitats and municipal and industrial use, or provide recreation opportunities and insure flood protection. Aspects of the projects include channel improvements, levee construction and construction of dams and recreation areas. Nonstructural measures include land management, reduced soil erosion, reduced sediment production and flood plain management including zoning, and flood warning and forecasting systems. Adverse environmental effects listed were: loss of about 7,500 acres of bottomland where the reservoirs are planned, loss of some free-flowing stream and minor accelerated erosion during construction activities. (Nielsen-Florida)
W73-04475

PLANNING FOR COASTAL PORTS ON A SYSTEMS BASIS: PRELIMINARY METHODOLOGICAL DESIGN,
Pennsylvania Transportation and Traffic Safety Center, University Park.

J. L. Carroll, and M. S. Bronzini.
Army Corps of Engineers Institute for Water Resources Report 72-7, May 1972. 232 p, 11 fig, 40 ref, 2 append, ACE Contract DACW31-71-C-0100.

Descriptors: *Harbors, *Coastal engineering, *Coastal structures, *Reviews, *Bibliographies, Planning, Costs, Design criteria, Abstracts, Navigation, Model studies, Forecasting, Ships, Transportation, Publications, Foreign trade, Import, Export.

A representative sample of the literature relating to the analysis of multipoint deep draft transportation systems is reviewed for the purpose of defining the major fields requiring investigation and identifying the methodologies which hold promise for use by the Corps of Engineers. Quantitative models for economic forecasting, shipping operations studies, and port planning and design are included in the survey, as well as several large-scale comprehensive transportation planning models. The literature survey is keyed to an abstract formulation of an integrated system of models for multipoint planning, and the resulting package con-

stitutes a set of preliminary specifications for development of such a model system. An annotated bibliography and a computerized bibliographic index are included. (Woodard-USGS)
W73-04525

8B. Hydraulics

STREAMFLOW ROUTING (WITH APPLICATIONS TO NORTH CAROLINA RIVERS),
North Carolina Water Resources Research Inst., Raleigh.

For primary bibliographic entry see Field 04A.
W73-03908

RHEOLOGY OF FRICTION-REDUCING POLYMER SOLUTIONS,
California State Coll. Los Angeles. Dept. of Mechanical Engineering.

P. I. Gold, and P. K. Amar.
Available from NTIS, Springfield, Va 22151-as AD-740 852; Price \$3.00 paper copy, \$0.95 for microfiche. Report, March 1971. 167 p, 59 fig, 16 tab, 40 ref, 5 append.

Descriptors: *Rheology, *Fluid mechanics, *Polymers, *Flow characteristics, *Model studies, Analytical techniques, Stress analysis, Friction, Viscosity, Drag, Hydraulics, Molecular structure, Mathematical studies, Head loss, Testing procedures.
Identifiers: *Polyethylene oxide solutions.

Stress decay characteristics of concentrated (0.14% - 1.03%) polyethylene oxide (PEO) solutions were measured. Viscosity losses of up to 50% were recorded at 30 deg C. Shear rates reached 1370/0.1 sec. Limiting viscosities were relatively independent of solution history. Limiting viscosities could be correlated by a power-law model over a 4 decade shear rate range. Disk flow was used to investigate the phenomena of turbulent drag reduction and subsequent mechanical degradation of dilute aqueous solutions of PEO. Reduced viscosity measurements (measure of molecular weight of polymer) were made on the dilute solutions. The extent of initial drag reduction, except for very low concentrations, was essentially independent of the polymer molecular weight. Lower molecular weight polymers degraded more slowly than higher molecular weight polymers in terms of degradation of reduced viscosity. The drag reduction depended primarily on the high molecular weight components of the distribution. The failure of reduced viscosity to correlate with drag reduction degradation was also noted. (Woodard-USGS)
W73-03913

MODEL STUDIES OF NAVIGATION IMPROVEMENTS, COLUMBIA RIVER ESTUARY: REPORT 2, SECTION 3, FIXED-BED STUDIES OF DISPOSAL AREAS C AND D,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.

F. A. Herrmann, Jr.
Available from NTIS, Springfield, Va 22151-as AD-742 274; Price \$3.00 paper copy, \$0.95 microfiche. Technical Report No 2-735, April 1972. 54 p, 2 fig, 27 plate, 6 photo, 3 tab.

Descriptors: *Channel improvement, *Dredging, *Navigation, *Columbia River, *Model studies, *Estuaries, Spoil banks, Streamflow, Tidal effects, Hydrologic data, Currents (Water), Evaluation, Engineering, Planning.

The existing, comprehensive fixed-bed model of the Columbia River estuary was used to determine whether two sites are suitable for use as primary disposal areas for dredging operations in the mouth of the Columbia River. Model tests were conducted to determine the hydraulic, salinity,

ENGINEERING WORKS—Field 08
Hydraulics—Group 8B

and shoaling characteristics of the areas for conditions of low, intermediate, and high freshwater discharge. Test results consist of tidal elevation measurements, current velocity measurements, flow predominance computations, salinity measurements, photographs of surface and bottom current patterns, and shoaling patterns for material placed within the disposal areas. The model tests indicate that material placed in either of these disposal areas will not be redeposited in the navigation channel in significant amounts. The capacity of both disposal areas, however, appears to be limited; thus it may not be possible to use either as a primary disposal area. (Woodard-USGS)
W73-03915

FORCES EXERTED BY WAVES BREAKING SEAWARD OF A VERTICAL SEAWALL,
California Univ., Berkeley. Coll. of Engineering.
R. C. Delmonte.
Available from NTIS, Springfield, Va 22151 as AD-745 899 - Price \$3.00 printed copy; \$0.95 cents microfiche. California University Hydraulic Engineering Laboratory Report HRL 9-20, June 1972. 29 p, 16 fig, 11 ref, append. USACE Contract DACW 72-69-C-0001-X-01.

Descriptors: "Sea walls," "Ocean waves," "Pressure," "Shore protection," "Reviews," "Evaluation," "Model studies," "Mathematical studies," "Equations," "Analytical techniques," "Coastal structures," "Retaining walls," "Engineering structures," "Design criteria." Identifiers: Vertical seawall, Breaking waves, Exerted forces.

Theories and data are examined that relate to wave pressures induced on a vertical seawall by the impingement of water waves which have broken seaward of the wall. Six articles which relate directly to this subject are compared. Each of the independent studies is reviewed briefly in regard to its purpose, test procedure, theory proposed, test results and conclusions. The formula presented by Honma and Horikawa for wave pressures on a vertical wall due to a broken wave is the most useful one for toe depths (water depth at the base of the wall) less than about 3 inches. Masashi Honma and Kiyoshi Horikawa (1965) summarized the results of their experimental studies by comparing the total force exerted by waves against a vertical seawall with an empirical formula they developed. First, they measured the total wave force on the seawall induced by a train of regular waves. Next, they measured the total wave force on the seawall induced by wind generated waves. The model vertical seawall consisted of a plate and two rings through which the plate was supported by a rigid frame. Strain gages were attached to the ring, which was used to measure the wave-induced forces on the plate. (Woodard-USGS)
W73-03925

WATER PRESSURE IN INTRAL- AND SUBGLACIAL CHANNELS,
For primary bibliographic entry see Field 02C.
W73-03927

MOVEMENT OF WATER IN GLACIERS,
California Univ., Los Angeles.
For primary bibliographic entry see Field 02C.
W73-03936

HYDROLOGIC ASPECTS OF FRESHENING UPPER OLD TAMPA BAY, FLORIDA,
Geological Survey, Tallahassee, Fla.
For primary bibliographic entry see Field 02H.
W73-04094

EFFECTS OF PROPOSED RUNWAY EXTENSIONS AT LAGUARDIA AIRPORT ON TIDES,
W73-04097

CURRENTS, SHOALING, AND DYE DISPERSION,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
H. B. Simmons, and W. H. Bobb.
Available from NTIS, Springfield, Va 22151 as AD-734 091; Price \$3.00 paper copy; \$0.95 microfiche. Miscellaneous Paper No 2-641, April 1964. 116 p, 28 plate, 21 photo, 11 tab.
Descriptors: "Model studies," "Harbors," "New York," "Engineering structures," "Channels, Ships, Airports, Runways, Design criteria, Hydraulic models, Shoals, Currents (Water), Tidal effects, Navigation, Hydrologic data.
Identifiers: "La Guardia Airport (N.Y.), Runway extensions, Channel diversion."

An existing model of New York Harbor was used to determine the effects of proposed pile-supported runway extensions at LaGuardia Airport on the hydraulic regimes of Rikers Island Channel, Flushing Bay, and adjacent reaches of East River. The extension of the north-south runway would extend across Rikers Island Channel, closing it to navigation. The plan included an alternate route for deep-draft vessels. Hydraulic tests were made to determine the effects of the plan on tide heights, current velocities, and surface and subsurface current directions. Shoaling studies were made to determine how the plan affected the transportation and deposition of available shoal material. Results of the tests indicate that the plan would have no major effects on the hydraulic regimes of the problem area; current strengths in adjacent reaches of East River would be increased slightly, but would still be well below existing maximum currents in other areas; and crosscurrents at the entrance to the alternate ship channel might create navigation problems for ships desiring to enter or leave this channel during strengths of flood or ebb currents, but no problem should exist at or near times of current slack. (Woodard-USGS)
W73-04096

AMPLIFICATION CRITERION OF GRADUALLY VARIED, SINGLE PEAKED WAVES,
Ottawa Univ., (Ontario). Dept. of Civil Engineering.
J. P. Jolly, and V. Yevjevich.
Colorado State University Hydrology Paper, No 51, December 1971. 39 p, 42 fig, 42 ref.
Descriptors: "Waves (Water)," "Channel flow," "Flood waves," "Supercritical flow," "Mathematical studies," "Equations," "Hydraulic structures," "Engineering structures," "Durability," "Analytical techniques," "Numerical analysis," "Channel morphology," "Flow rates," "Velocity," "Wave pile-up."
Identifiers: Wave peak.

Some hydraulic properties, obtained using the Chezy resistance law, that distinguish amplifying waves from attenuating waves are found by a numerical integration of the governing hyperbolic, partial differential equations of supercritical, gradually varied waves flowing in a channel with a rectangular cross section. The supercritical, gradually varied flow is simulated by using various integration techniques of the specified intervals scheme of the method of characteristics solution to the governing system of equations. One of these integration techniques is used to determine attenuation and amplification characteristics of gradually varied, single peaked waves. Prior to this determination, criteria found by various investigators for predicting the stability of uniform flow are shown to be equivalent. One of the criteria, the Vodernikov number, which contains parameters dependent on the frictional law, channel cross-sectional shape and Froude number, is also the criterion for predicting amplification of gradually varied, single peaked waves. (Woodard-USGS)
W73-04097

EVALUATION OF FLARED OUTLET TRANSITIONS,
Army Engineer Waterways Experiment Station, Vicksburg, Miss.
B. P. Fletcher, and J. L. Grace, Jr.
Available from NTIS, Springfield, Va 22151 as AD-745 882. Price \$3.00 printed copy; \$0.95 microfiche.
Descriptors: "Storm drains," "Culverts," "Outlet works," "Scour," "Design criteria," "Hydraulic structures," "Model studies," "Tailwater," "Aprons," "Testing procedures," "Evaluation," "Engineering structures."
Identifiers: "Flared outlet transitions."

The applicability of various lengths of simple flared outlet transitions was investigated as a means of preventing excessive scour at culvert and storm-drain outlets subject to various conditions of discharge and tailwater. Model tests of outlet transitions consisting of various lengths and elevations of horizontal aprons with sidewalls flared one on eight were conducted to determine the maximum limiting discharges for which satisfactory performance could be maintained with various conditions of tailwater. Results are presented in dimensionless parameters and design charts for ready determination of (a) the maximum discharge permissible with a given diameter culvert, given lengths of flared outlet transitions, and various depths of tailwater, and (b) the lengths of flared outlet transition required for a given diameter culvert, a given discharge, and various depths of tailwater. This type of protection is considered effective for those outlets subject to the usual range of discharges, provided sufficient and relatively large tailwater depths will exist downstream. (Woodward-USGS)
W73-04196

QUANTITATIVE CHARACTERIZATION OF CHANNEL NETWORK STRUCTURE,
Thomas J. Watson Research Center, Yorktown Heights, N.Y.
J. S. Smart.
Water Resources Research, Vol 8, No 6, p 1487-1496, December 1972. 7 fig, 5 tab, 18 ref. NR 389-155. ONR Contract N00014-70-C-0188.

Descriptors: "Geomorphology," "Statistical methods," "Drainage patterns (Geologic)," "Topography," "Erosion," "Geologic control," "Drainage density," "Tributaries," "Horton's law."

The most commonly used quantitative parameters for characterizing channel networks are derived from a Horton analysis and include bifurcation ratios and stream length ratios. Although these parameters give useful information about individual networks, they are generally ineffective in distinguishing differences in network structure caused by lithologic controls and degree of maturity. This failure is due in part to the random nature of network topology and link lengths and in part to the fact that the Horton analysis tends to average out many of the details that characterize such differences. Parameters derived from considerations of statistical geometric similarity are relatively successful in characterizing network structure. For a simple example, let l_e and l_i be the mean exterior and interior link lengths, respectively, and a_e and a_i be the means of the associated drainage areas. Four dimensionless parameters that can be constructed from this set are l_e/l_i , a_e/a_i , l_e^2/a_e , and l_i^2/a_i . These quantities are effective in detecting differences due to varying lithology and degree of maturity. (Knapp-USGS)
W73-04204

SHAPE EFFECTS ON RESISTANCE IN FLOOD-PLAIN CHANNELS,
Agricultural Research Service, Beltsville, Md. Hydrograph Lab.
C.-L. Yen, and D. E. Overton.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper

Field 08—ENGINEERING WORKS

Group 8B—Hydraulics

9306, p 219-238, January 1973. 10 fig, 1 tab, 17 ref, append.

Descriptors: *Flood plains, *Roughness (Hydraulic), *Open channel flow, *Shear stress, Mathematical studies, Laminar flow, Turbulent flow, Equations, Hydraulics, Drag, Channel morphology.

For flow computation in flood plain channels, the flow cross section is usually divided into subsections to ensure hydraulic homogeneity. However, the question of whether or not to include the division lines as part of the wetted perimeter still remains unanswered. In this study, efforts were made to determine division lines having zero near shear stress so that they need not be included in the wetted perimeter. Laminar flow cases were solved to gain qualitative insight into the shape effects on resistance and location of division lines. For turbulent flows, division lines were determined from velocity distribution patterns; and resistance coefficients for both laminar and turbulent flows and lower than those in wide rectangular channels having the same boundary materials. New formulas are proposed for computation of discharge in both main-channel and flood-plain portions. (Knapp-USGS)
W73-04213

LONGITUDINAL DISPERSION IN SINUOUS CHANNELS,
James Cook Univ. of North Queensland,
Townsville (Australia). Dept. of Engineering.
For primary bibliographic entry see Field 05B.
W73-04214

UNIT-RESPONSE METHOD OF OPEN-CHANNEL FLOW ROUTING,
Geological Survey, Oklahoma City, Okla.
V. B. Sauer.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9499, p 179-193, January 1973. 8 fig, 2 tab, 14 ref, append.

Descriptors: *Routing, *Open channel flow, *Hydrograph analysis, *Flood routing, *Flood waves, Mathematical models, Flood forecasting, Unit hydrographs, Time lag, Travel time, Streamflow forecasting, Computer programs.

Unit-response flow routing is a technique of open-channel flow routing based on the unit hydrograph principle of lagging and superposition. The unit response is defined as the flow hydrograph at a downstream location resulting from a constant inflow of 1 cfs during a selected duration period, D, at an upstream location. It can be derived from actual records, but for general application it is derived synthetically by routing a translation hydrograph through reservoir storage to obtain an instantaneous unit response, and transforming this response to the selected D-hour unit response. Lag, or translation time, is used to account for flood-wave travel time in the channel. This can be varied with depth. Routing intervals of from 1 hr to 24 hr and routing reaches from 10 miles to 150 miles have been used successfully. (Knapp-USGS)
W73-04215

COMPUTER MODEL OF VORTEX SHEDDING FROM A CYLINDER,
Rendel, Palmer and Tritton, London (England).
J. R. Chaplin.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9491, p 153-165, January 1973. 3 fig, 1 tab, 13 ref, append.

Descriptors: *Vortices, *Flow around objects, *Hydraulics, *Mathematical models, *Unsteady flow, Turbulent flow, Turbulence, Non-uniform flow, Fluid mechanics.

Identifiers: *Flow around cylinders, *Vortex shedding.

A mathematical model of unsteady flow around a cylinder gives lift, drag, and velocity fluctuations in reasonable agreement with experimental results. Vorticity is represented by element Rankine vortices, which are superimposed on the potential flow around a cylinder to form the boundary layers and separated shear layers. The solution advances timewise from assumed initial conditions. At each time step, every element vortex is moved through a distance equal to the product of its instantaneous translational velocity and a small time increment, determined after stability tests. Concentrated clouds of vorticity form and are shed from the cylinder, with accompanying fluctuations in lift and drag. The total number of element vortices in the model is minimized by replacing each cloud by a single equivalent vortex. Because feedback from the formation region to the separation points is present in the model, it is potentially well-suited to studies of flow around oscillating cylinders. (Knapp-USGS)
W73-04216

BAGNOLD APPROACH AND BED-FORM DEVELOPMENT,

C. J. Pratt.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9469, p 121-137, January 1973. 7 fig, 4 tab, 6 ref, append.

Descriptors: *Sediment transport, *Channel morphology, *Sedimentary structures, *Bed load, Hydraulics, Alluvial channels, Shear stress, Model studies, Hydraulic models, Particle size, Dunes, Scour, Sedimentology.

The results of a laboratory investigation of the flow over a narrowly graded 0.49 mm sand were examined within the framework of Bagnold's theory for the flow of cohesionless grains in fluid. General agreement was found between the experimental and predicted behavior. Bagnold's primary and secondary bed features correspond to ripple type and dune type bed-forms, respectively. The subdivision of the secondary features between intermediate dunes, flattened dunes, and developing dunes occurs at a particular ratio of the bed load to the associated intergranular fluid stress at each of the four depths of flow investigated between 0.08 m and 0.46 m. Peak dune development represents the end of wholly viscous grain shearing in the moving grain dispersion. The conditions leading to the disappearance of bed features are discussed. (Knapp-USGS)
W73-04217

HYDRAULIC ROUGHNESS OF ICE COVERS,
Lund Inst. of Tech. (Sweden). Div. of Hydraulics.
For primary bibliographic entry see Field 02C.
W73-04218

ESTIMATING DISCHARGE FROM SUPERELEVATION IN BENDS,

State Univ. of New York, Buffalo.

R. P. Apmann.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9482, p 65-79, January 1973. 4 fig, 2 tab, 30 ref, 3 append.

Descriptors: *Stage-discharge relations, *Open channel flow, *Meanders, *Discharge measurement, Channel morphology, Rivers, Streams, Stream gages.

Identifiers: *Bends (Hydraulic).

A method is presented for estimating open channel discharge from the maximum superelevation measured in the bends. It is based on data assembled from about 70 separate experiments in the subcrit-

ical flow regime, including information on channels of different cross-sectional shapes, included angles, and curvature ratios. The resulting predictive equation includes the effects of curvature ratio, included angle, and super-elevation on discharge. The method was applied to a single flow event on Buffalo Creek, N. Y. Only curves in which the flow remained inbank could be used to predict discharge, and super-elevations of less than 0.25 ft (7.6 cm) had to be excluded. The probable error of the Buffalo Creek analysis was 8% with respect to the mean of the discharges predicted from individual curves, while the data upon which the method was based had a probable error of 12%. (Knapp-USGS)
W73-04219

EXACT NONLINEAR MODEL OF WAVE GENERATOR,
Army Coastal Engineering Research Center, Washington D.C.
For primary bibliographic entry see Field 02E.
W73-04220

UNIFIED NDIMENSIONAL FORMULATION FOR OPEN CHANNEL FLOW,
Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering.

P. Minton, and R. J. Sobey.
Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 99, No HY1, Paper 9468, p 1-12, January 1973. 5 fig, 1 tab, 8 ref, append.

Descriptors: *Open channel flow, *Gradually varied flow, *Steady flow, Hydraulic jump, Mathematical studies, Equations, Profiles, Chezy equation, Numerical analysis.

The specific force, specific energy, and a Chezy-resistance solution for gradually varied flow in wide open channels are presented on a single non-dimensional diagram with a common depth ordinate. The gradually varied flow solution appears as isolines of length along the channel, from a specified initial depth, on axes of normal depth and flow depth. Lines on the diagram representing normal depth, critical depth, and transitional depth produce a natural division of water surface profiles into M, S, C, and H categories. The unified approach represented by this general open channel diagram should prove useful in the understanding and preliminary estimation of both rapidly and gradually varied steady flows in open channels. (Knapp-USGS)
W73-04223

REGIONAL INVENTORY REPORT-SOUTH ATLANTIC-GULF REGION, PUERTO RICO AND THE VIRGIN ISLANDS.
Corps of Engineers, Atlanta, Ga, South Atlantic Div.

Available from NTIS, Springfield, Va 22151 as AD-730 693 Price \$6.00 paper copy; 95 cents microfiche. National Shoreline Study, August 1971. 371 p, 4 fig, 2 tab, 8 append.

Descriptors: *Shore protection, *Beach erosion, *Census, *Coasts, *Southeast U.S., Puerto Rico, Virgin Islands, Atlantic Ocean, Gulf of Mexico, Investigations, Reviews, Data collections, Planning, Projects, Federal government, Shores, Coastal engineering, Coastal structures, Storms, Tides, Environmental effects, Land development, Recreation, Shoals, Shoreline cover, Berms, Bays, Estuaries, Navigation.
Identifiers: *National shoreline study, Regional inventory.

In 1968, the 90th Congress authorized National appraisal of shore erosion and shore protection needs. The appraisal consists of three aspects which were carried out concurrently: Regional In-

ENGINEERING WORKS—Field 08
Hydraulic Machinery—Group 8C

ventories, Shore Protection Guidelines, and Shore Management Guidelines. This regional inventory report encompasses the shorelines of the states of North Carolina, 3,661.0 miles; South Carolina, 3,063.0 miles; Georgia, 204.4 miles; Florida, 6,265.8 miles; Alabama, 351.7 miles, and Mississippi 247.0 miles (the South Atlantic-Gulf States, total 13,792.9 miles) plus Puerto Rico, 595.7 miles and the Virgin Islands, 233.8 miles. As part of the overall study of the national shorelines, the report will help provide a comprehensive assessment of shore erosion problems from the national viewpoint. The specific purposes of the Regional Inventory are to assess the nature and extent of erosion; develop conceptual plans for needed shore protection; develop general order-of-magnitude estimates of cost for the selected shore protection; identify ownership and use of shores; and locate coastal areas where title uncertainty exists. (Woodard-USGS)
W73-04228

PREDICTING EFFECTS OF DEAD ZONES ON STREAM MIXING.
Vanderbilt Univ., Nashville, Tenn. Dept. of Environmental and Water Resources Engineering.
For primary bibliographic entry see Field 05B.
W73-04288

NONUNIFORM GROUNDWATER-CONDUIT DISCHARGE AND HEAD LOSS,
University of Southern California, Los Angeles.
Dept. of Civil Engineering.
For primary bibliographic entry see Field 02F.
W73-04362

STATISTICAL PROPERTIES OF MISSOURI RIVER BED FORMS.
Sargent and Lundy, Chicago, Ill.
V. S. S. Annaabha, W. W. Sayre, and R. H. Livesey.
Journal of the Waterways, Harbors and Coastal Engineering Division, American Society of Civil Engineers, Vol 98, No WW4, Paper 9358, p 489-510, November 1972. 9 fig, 4 tab, 16 ref, append.

Descriptors: *Channel morphology, *Sedimentary structures, *Bed load, *Sediment transport, *Alluvial channels, Dunes, Flow resistance, Roughness (Hydraulic), Statistics, Statistical methods, Sands, Profiles, Sand waves, *Missouri River.

A logarithmic resistance relationship for flow near rough boundaries relates bed form dimensions to flow resistance in large alluvial channels with dune beds. Bed profile data, obtained from a reach of the Missouri River at Omaha, Neb., were analyzed statistically to obtain characteristic bed form dimensions. The zero-crossing distances and amplitudes analysis was found to be the statistical method best suited for this investigation. Estimates of bed form dimensions together with frequency distributions of bed elevations, wave lengths, amplitudes and heights of the dune bed forms are presented. A plot of the bed form friction factor versus a modified relative roughness parameter incorporating statistical estimates of bed form dimensions is shown to be roughly consistent with the Karman-Prandtl logarithmic law. (Knapp-USGS)
W73-04365

PHOTOGRAMMETRY AND HYDRAULIC SURFACES,
New Brunswick Univ., Fredericton.
For primary bibliographic entry see Field 07B.
W73-04368

THE LATERAL INFLOW INTO SUBMERGED DRAINS,
Ghent Rijksuniversiteit (Belgium). Laboratorium voor Hydraulica.

A. Van der Beken, F. De Troch, M. De Somer, and F. C. Zuiderma.

International Association of Hydrological Sciences Bulletin, Vol 17, No 3, p 273-289, October 1972. 6 fig, 4 tab, 10 ref.

Descriptors: *Tile drainage, *Equations, *Groundwater movement, *Soil water movement, Hydrogeology, Water levels, Discharge (Water), Water yield.

An attempt is made to explain the field measurements of piezometric height and discharge rate in a submerged drain system. The lateral inflow into the drain pipe is not necessarily uniformly distributed as is usually assumed. Hence, in analyzing the hydrological performance of the drain pipe in the field, this fact must be considered. A general formula is presented for calculating the actual distribution of the lateral inflow, and a practical application is discussed. (Knapp-USGS)
W73-04384

ROUGHNESS IN A MODEL OF OVERLAND FLOW,

Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

P. E. Fawkes.

M Sc Thesis, June 1972. 109 p, 28 fig, 10 tab, 38 ref. OWRR B-030-COLO (4) and B-064-COLO (3).

Descriptors: *Overland flow, *Hydraulic models, *Rainfall-runoff relationships, *Roughness (Hydraulic), Turbulent flow, Laminar flow, Hydrographs, Hydrograph analysis, Mathematical models, Rainfall intensity, Impact (Rainfall), Turbulence, Surface runoff, Fluid friction.

Runoff hydrographs from various simulated rain intensities of 1 to 4 in./hr and various catchment surfaces including butyl rubber were studied in a half-acre model watershed. The catchment geometry was a converging conic section 116 ft long, with horizontal angles between the converging boundaries varying between 30 and 104 deg. A mathematical model of overland flow, with the kinematic approximations to the overland flow equations, was used to compute runoff hydrographs. The four friction parameters in the model were optimized by comparing observed equilibrium hydrographs with computed hydrographs. The friction parameters accounted for the effect of raindrop impact for both laminar and turbulent flow. For the runoff data from the experimental facility, the friction parameters were reasonably consistent. Mean values of the parameters for each surface condition were used to predict runoff for partial equilibrium hydrographs. Predictions were good for the high intensity rain of 4 in./hr but were poor for some of the lower rain intensities. (Knapp-USGS)
W73-04508

SIMPLE WAVES ON SHEAR FLOWS: SIMILARITY SOLUTIONS,
Newcastle-upon-Tyne Univ. (England). School of Mathematics.
For primary bibliographic entry see Field 02E.
W73-04539

THE INTERACTION OF LARGE AMPLITUDE SHALLOW-WATER WAVES WITH AN AMBIENT SHEAR FLOW: NON-CRITICAL FLOWS,
Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
For primary bibliographic entry see Field 02E.
W73-04540

8C. Hydraulic Machinery

CENTER PIVOT IRRIGATION,

Colorado State Univ., Fort Collins. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 03F.
W73-03978

CIRCULATING WATER SYSTEMS WITHOUT VALVES,

Gilbert Associates, Inc., Reading, Pa.
For primary bibliographic entry see Field 05D.
W73-04035

NEW STRUCTURAL DESIGNS FOR H. V. TRANSMISSION TOWERS,
Società Anonima Elettrificazione S.p.A., Milan, Italy.

A. Carpene.

Paper 22-04, International Conference on Large High Tension Electrical Systems (CIGRE), Paris, France, Aug-Sept 1972. 7 p, 3 fig, 1 tab, 7 ref.

Descriptors: *Structural design, *Transmission towers, Structural shapes, Foundations, Steel structures, Cross sections, Weight, Aesthetics, Transmission (electrical).

Identifiers: Self-supporting towers, Towers, Torsion, Aluminum towers, Guyed towers, Bracing, *High voltage, Geometric shapes.

A structural study was performed to learn whether triangular bases or sections could be used with technical, economic, and aesthetic benefits over square-based towers. The study considered types of materials, diagonals, bracings, guyed vs self-supporting, structural member shapes, footings, and tensions for 345-, 380-, 500-, and 765-kv lines. Triangular towers require structural members with a 60-deg angle between flanges, whether of V, U, or W cross section, a disadvantage, but necessary to avoid complicated leg connections. The triangular tower needs less bracing and fewer diagonals, improving the aesthetics, but requiring heavier members. Comparisons are made between guyed and self-supporting towers. A table summarizes all comparisons for the range of voltages, showing possible reductions in weight and numbers of members. (USBR)
W73-04078

AUTOMATIC DESIGNING OF TRANSMISSION LINES AND SUBSTATIONS,
Ente Nazionale per l'Energia Elettrica, Milan (Italy).

M. Bontempo.

Paper 23-11, International Conference on Large High Tension Electrical Systems (CIGRE), Paris, France, Aug-Sept 1972. 18 p, 14 fig, 6 ref.

Descriptors: *Electrical design, *Automation, *Optimum design, Transmission lines, Substations (electrical), Computers, Data processing, Economics, Transmission (electrical), Electrical engineering, Transmission towers, Systems analysis, Power system operation.

Identifiers: *Computer-aided design, Automatic plotters, Tower spotting, Computer applications.

The principles underlying automatic design of transmission lines and substations using an electronic computer are described. The purpose is not to describe calculation programs, but to analyze the power system design process, to indicate which stages can be automated, and to explain the role of the power system engineer. Advantages of integrated design automation are: (1) freedom from dependence upon technicians; (2) better possibility of obtaining an optimum solution; and (3) availability of numerical input data to permit integration of communications with other automated systems. Requirements for fully exploiting these advantages include: (1) an integrated automatic

Field 08—ENGINEERING WORKS

Group 8C—Hydraulic Machinery

system; (2) freedom of man-machine interface for making key decisions; and (3) allowance for adequate design modifications at any stage and the capability of up-dating design documents automatically. (USBR)
W73-04079

ENVIRONMENTAL ASPECTS OF HIGH VOLTAGE SUBSTATIONS,

South of Scotland Electricity Board, Glasgow; and Central Electricity Generating Board, London (England).

A. M. Blair, A. U. Dowell, and G. A. Goult.

Paper 23-05, International Conference on Large

High Tension Electrical Systems, (CIGRE), Paris,

France, Aug-Sept 1972. 16 p, 9 fig, 3 ref.

Descriptors: *Substations (Electrical), *Environmental effects, Costs, *Landscaping, *Site selection, Attenuation, Rural areas, Urban areas, *Circuit breakers, High voltage, Economics.

Identifiers: *Noise reduction, Great Britain, Environmental quality, Public opinion, Building design.

Increasing concern for the quality of the environment requires developers to demonstrate their intention and capability to preserve the landscape. Statutory and regulating controls in the United Kingdom require that Electricity Boards incorporate visual effects and audible noise conditions in the design of substations. Ways of minimizing the visual and aural effects of substations by landscaping, designing low-height structures, use of color, choice of surfacing materials, design of buildings, and the attenuation of switchgear noise are discussed. Landscaping is planned, budgeted, and implemented as a part of every substation installation. Problems of reconciling economy with additional amenity expenditures are discussed with respect to substation site selection. Landscaping objectives are stated and applied to illustrations of an urban and a rural substation. (USBR)

W73-04080

RADIO INTERFERENCE FROM HVDC CONVERTER STATIONS,

Bonneville Power Administration, Portland, Oreg.

S. A. Annestrand.

Institution of Electrical and Electronic Engineers, Transactions, Power and Apparatus Systems, Vol PAS-91, No 3, p 874-882, May-June 1972. 13 fig, 5 ref, disc.

Descriptors: *Radio interference, Extra high voltage, Direct current, Disturbances, Electrical equipment, Radiation, Transmission (Electrical), Switchgears (Electrical), Transmission lines, Instrumentation, Cathodes, Radiation shielding, Frequency.

Identifiers: *Converters (Electrical), Breakdown,

Weather effect, Anodes, Electromagnetic pulses,

Thyristors, Radiation shielding, Ultra high voltage.

Radio interference (noise) is generated in HVDC converter stations by the rapid breakdown of the voltage between anodes and cathodes of the converter valves during ignitions. This noise, normally dominant in HVDC converter stations, is independent of weather conditions, and is influenced by the characteristics of the converter equipment and by valve operating conditions. These voltage breakdowns cause steep current pulses to be injected into the system, resulting in high frequency radiation from the valves, switchgear equipment, and outgoing transmission lines. Factors influencing and measures for reducing radio interference levels are discussed. Interference in the frequency range from 0.1 to 10 MHz is analyzed. (USBR)

W73-04084

AN ANALYSIS OF TRANSMISSION LINE AUDIBLE NOISE LEVELS BASED UPON FIELD AND THREE-PHASE TEST LINE MEASUREMENTS,

Bonneville Power Administration, Portland, Oreg.

D. E. Perry.

Institution of Electrical and Electronic Engineers

Transactions, Power and Apparatus Systems, Vol PAS-91, No 3, p 857-865, May-June 1972. 14 fig, 1 tab, 2 ref, disc.

Descriptors: *Transmission lines, Extra high voltage, Laboratory tests, On-site tests, Bundled conductors, Rain, Weather, Attenuation, Analysis, Electric conductors, Instrumentation, Acoustics.

Identifiers: *Electric coronas, *Noise (Sound), Pressure waves, Noise levels, Test results, Weather effect, Electric discharges, Ultra high voltage.

With transmission line voltages at the 500-kv level and above, a new problem associated with the corona discharge on conductors became apparent—the generation of acoustic pressure waves with the resulting audible noise. Audible noise is primarily a foul weather phenomenon resulting from water drops collecting on the bottom of the conductor, thereby increasing the localized surface electric field gradient above the corona onset level and, in turn, causing streamer discharge and a burst of acoustic pressure waves. Audible noise measurements are reported for a 3-phase test line using 4 different conductor configurations energized at 525 kv line to line. A statistical analysis of the resulting noise levels is presented. The test line was energized single phase and compared with single-phase laboratory test results. The noise level from a 4-bundle configuration at reduced phase spacing simulating 735-kv operation is evaluated. (USBR)

W73-04085

PERTINENT DATA ON SPILLWAY TAINTER GATES FOR CORPS OF ENGINEERS PROJECTS,

Army Engineer Waterways Experiment Station, Vicksburg, Miss.

R. G. Cox.

Available from NTIS, Springfield, Va 22151 as AD-745 883; Price \$3.00 printed copy; \$0.95 cents microfiche. Miscellaneous Paper H-72-7, June 1972. 53 p, 1 fig, 1 tab, append.

Descriptors: *Spillway gates, *Dams, *Locks, *Fluid mechanics, *Hydraulic structures, Engineering structures, Operation and maintenance, Facilities, Hydrologic data, Classification.

Identifiers: Tainter gates, Gate opening practices.

Spillway tainter gates of the Corps of Engineers are classified according to whether they are mounted on round or flat crests or at channel inverters. Pertinent data concerning the gates, crest forms, and gate opening practices are given in tabular form. Small-scale cross sections of the gated structures are included. (Woodard-USGS)

W73-04377

8D. Soil Mechanics

NON-LINEAR THERMODYNAMICS OF SOIL-WATER-HEAT SYSTEMS,

Haryana Agricultural Univ., Hissar (India). Dept. of Physics.

For primary bibliographic entry see Field 02G.
W73-03960

THERMODYNAMICS OF SOIL-WATER SYSTEM,

Haryana Agricultural Univ., Hissar (India). Dept. of Physics.

For primary bibliographic entry see Field 02G.
W73-03961

RELATION BETWEEN ENERGY AND ERROR DUE TO NUCLEAR STATISTICS FOR DENSITY MEASUREMENT BY GAMMA RAY TRANSMISSION,

Negev Inst. for Arid Zone Research, Beersheba (Israel).

K. Preiss.

Soil Science, Vol 110, No 3, p 151-156, September, 1970. 2 fig, 8 ref.

Descriptors: *Gamma rays, *Soil density probes, *Density, Radiation, Nuclear meters, Mass, Measurement.

Identifiers: Density measurement.

When measuring density by gamma ray transmission through a thickness of material, the time of counting for a given standard error of density due to nuclear statistics depends on the energy of the radiation. The relationship between this time interval and the radiation energy is analyzed. (Skogboe-Carlsbad State)

W73-03964

HYDROSTATICS IN SWELLING SOILS AND SOIL SUSPENSIONS: UNIFICATION OF CONCEPTS,

Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Plant Industry.

J. R. Philip.

Soil Science, Vol 109, No 5, p 294-298, May, 1970. 6 ref.

Descriptors: *Soil mechanics, *Soil physical properties, *Hydrostatic pressure, Overburden.

Identifiers: *Swelling, *Soil suspensions, Brownian motion, Double layer, Moisture potential, Gravitational potential, Overburden potential.

Whether the concepts for water soil relationships hold true to dilute soil suspension subject to gravity and Brownian motion (double layer effects being negligible) is examined. It is shown that they do and that in such systems, the moisture potential is minus the 'colloid osmotic pressure.' Moisture potential is a unique function of the moisture ratio for (i) any suspension under equilibrium conditions and (ii) a suspension of uniform particles under either non-equilibrium or equilibrium conditions. (Skogboe-Carlsbad State)

W73-03982

MOVEMENTS IN DAMS DUE TO RESERVOIR FILLING,

California Univ., Berkeley.

E. S. Nobari, and J. M. Duncan.

In: Proceedings, American Society of Civil Engineers, Special Conference on the Performance of Earth and Earth-Supported Structures, Vol I Part 1, Purdue Univ., Lafayette, Indiana, June 1972. 19 p, 11 fig, 1 tab, 19 ref.

Descriptors: *Earth dams, *Rockfill dams, *Settlement (Structural), Finite element analyses, Bibliographies, Laboratory tests, Forecasting, Consolidation, Creep, Dam design, Stress, Cracks, Soil tests, Movement, Calculations.

Identifiers: El Tierrillo Dam (Mexico), *Horizontal movement, *Reservoir filling, Oroville Dam (Ca), Embankment subsidence, Stress-strain curves, Relative density, Dam stability, Zoned embankments.

Measurements made in many earth and earth-rockfill dams have shown that large settlements, horizontal movements, and cracking are frequently caused by reservoir filling. Corresponding measurements in a number of dams are summarized. These movements result from a combination of 2 counteracting effects of reservoir filling: (1) the water loads on the dam, and (2) softening and weakening of the fill material caused by wetting. No practical procedure for predicting and analyzing the magnitudes of such movements previously existed, but a new finite element

method was used to predict movements of Oroville Dam in California. Comparisons between predicted and measured movements confirm the effectiveness of this procedure and provide a better understanding of the performance of earth and earth-rockfill dams. (USBR)
W73-04073

EARTH AND EARTH-ROCK DAMS, Tippets-Abbett-McCarthy-Stratton, New York. J. Lowe, III.

In: *Proceedings, American Society of Civil Engineers, Special Conference on Performance of Earth and Earth-Supported Structures, Vol II, Purdue Univ., Lafayette, Indiana, p 55-70, June 1972.* 22 ref.

Descriptors: *Earth dams, *Rockfill dams, *Deformation, *Finite element analysis, *Seepage, Settlement (Structural), Laboratory tests, Embankments, Seepage control, Analysis, Bibliographies, Triaxial tests, Shear tests, Evaluation, Cracks, Forecasting, Poisson ratio, Dam design, Soil tests.

Identifiers: Horizontal movement, El Infiernillo Dam (Mexico), Stress-strain curves, Rapid drawdown.

Nineteen papers presented at the Earth and Earth-Rock Dams Session of the Conference on Performance of Earth and Earth-Supported Structures are evaluated briefly and commented upon. Ten papers concern the performance of earth and earth- and rockfill structures with respect to seepage, 5 of which discuss dam failures; and 9 cover dam deformation analyses, 6 of which use the finite element method for predicting deformations. Two topics of particular interest are discussed: (1) the finite element method of analysis, with emphasis on the stress-strain characteristics of embankment materials; and (2) the horizontal deformation performance of El Infiernillo Rockfill Dam. Discussion of the second topic included a summary of the performance data derived, evaluation of performance acceptability, prediction methods, and design modifications to improve performance. (USBR)
W73-04074

INFLUENCE OF PROGRESSIVE FAILURE ON SLOPE STABILITY, National Soil Services, Inc., Houston, Tex. F. Romani, C. W. Lovell, Jr., and M. E. Harr.

Journal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers, Vol 98, No SM11, Paper 9349, p 1209-1223, November 1972. 14 fig, 12 ref, append.

Descriptors: *Slope stability, *Embankments, *Soil mechanics, Mechanical properties, Stress analysis, Stress, Shear strength.

Analytical evidence is presented on the effect of cracking on the slope stability of idealized embankment-foundation sections. The embankment boundary had a circular shape and the bounded mass was homogeneous, isotropic, and linearly elastic. The technique of conformal mapping was used to calculate elastic stresses induced by body forces. Various combinations of parameters were applied to represent peak and residual shear strength conditions along the cracked and uncracked portions of the critical surface. The factor of safety against slope instability varies considerably with the degree of development of the crack. Full crack development yields the minimum value for progression from toe to crest. However, partial development of the discontinuity is the least safe state when the direction of development is from crest to toe. The findings are significant not only for slope stability but for all problems involving a potential for progressive failure. (Knapp-USGS)
W73-04366

LATERAL PRESSURES FROM SOFT CLAY, Melbourne Univ., Parkville (Australia). Dept. of Civil Engineering.

P. J. Moore, and G. K. Spencer.
Journal of the Soil Mechanics and Foundations Division, American Society of Civil Engineers, Vol 98, No SM11, Paper 9360, p 1225-1244, November 1972. 17 fig, 2 tab, 14 ref, append.

Descriptors: *Creep, *Clays, *Soil mechanics, *Earth pressure, *Retaining walls, Compaction, Dead loads, Loads (Forces), Liquid limits, Soil properties, Plasticity.

Following cessation of retaining wall movement, earth pressures from soft clay with liquidity indices equal to or greater than unity creep back to the at-rest value. Rigid model tests indicate that reductions in the lateral pressure occur immediately when wall movements are induced. The conventional active pressure distribution is produced when the wall is subjected to a horizontal displacement of approximately 5% of the wall height. Immediately after the wall movements are terminated the lateral pressure increases, with the long term pressure equalling the lateral pressure acting before wall movement was initiated. This long term pressure can be calculated by means of an expression which is similar to the conventional long term active pressure expression but with the relaxed shear strength being considered as the mobilized shear stress in the backfill. The relaxed shear strength may be measured in torsion shear tests. Alternatively the long term pressure may be calculated from values of the rest coefficient, which can be measured through tests in a special triaxial cell. (Knapp-USGS)
W73-04367

PLAQUEMINE LOCK CLOSURE, MISSISSIPPI RIVER AND TRIBUTARIES PROJECT, IBERVILLE PARISH, LOUISIANA, ASSOCIATED WATER FEATURES, BAYOU PLAQUEMINE AND GULF INTRACOASTAL WATERWAY (FINAL ENVIRONMENTAL IMPACT STATEMENT).

Army Engineer District, New Orleans, La.

Available from the National Technical Information Service as EIS-LA-72-4828-F, \$4.25 in paper copy, \$0.95 in microfiche. May 8, 1972. 39 p, 2 map.

Descriptors: *Louisiana, *Environmental effects, *Levees, *Flood protection, Earthworks, Locks, Hydraulic structures, Structures, Borrow pits, Mississippi River, Rivers, River basins, Flood control, Aesthetics.

Identifiers: *Environmental Impact Statements, *Plaquemine Lock (La.).

This action, a part of the Mississippi River and Tributaries Project, involves the permanent closing of the Plaquemine Lock in Iberville Parish, Louisiana, by the construction of an earthen levee. The purpose is to provide continued integrity to the Mississippi River levee flood protection system. This project will protect some 3,300 square miles of land between the Mississippi River and the Atchafalaya Basin from flooding. Filling the lock will also enhance the property by eliminating the unsightly conditions that now exist in the deteriorated lock and the immediate area. The only adverse effects will occur during construction and will be minor and temporary in nature. The lock will be filled with haul obtained from a borrow area consisting of about 29 acres. Alternatives considered by not recommended included: a combination concrete wall and an earthen embankment across the riverward end of the lock, a closure structure with gate to prevent stagnation, and no action. (Nielsen-Florida)
W73-04457

SE. Rock Mechanics and Geology

BEHAVIOR OF KOYNA DAM—DEC. 11, 1967 EARTHQUAKE,

Roorkee Univ., (India).
S. S. Saini, J. Krishna, and A. R. Chandrasekaran.
Journal of the Structural Division, American Society of Civil Engineers, Vol 98, No. ST7, p. 1393-1412, July 1972. 12 fig, 3 tab, 20 ref, 2 append.

Descriptors: *Concrete dams, *Earthquakes, *Theoretical analysis, *Earthquake engineering, Bibliographies, Damages, Dams, Gravity dams, Design, Finite element analysis, Stress, Structural engineering, Vibrations, Repairing, Cracks, Earthquake damage.

Identifiers: Koyna Dam (India), Dynamic response, Renovating.

A severe earthquake, its epicenter close to Koyna Dam in India, caused horizontal cracks in the upper section of the dam. The site of Koyna Dam, a concrete gravity structure, was considered non-seismic, and was designed on a no-tension basis under normal loading conditions. To check observed with theoretical behavior of the dam, the highest section was analyzed based on the recorded ground motion during the earthquake. The theoretical analysis indicates the zones of maximum tensile stresses coincide with the location of the cracks. The study confirms the observed behavior indicating the adequacy of theoretical analyses both treating the dam as a cantilever beam, and by the finite element technique. To enable the dam to withstand future shocks, tentative repairs and permanent strengthening are proposed and discussed. (USBR)
W73-04076

8G. Materials

COOLING WATER SCALE CONTROL: THE SCALE METER AND THE CRITICAL PH OF SCALING,

Questonics, Los Angeles, Calif.
For primary bibliographic entry see Field 05D.
W73-04003

COOLING WATER TREATMENT—WHERE DO WE STAND,

Betz Lab., Inc., Trevose, Pa.

For primary bibliographic entry see Field 05D.
W73-04016

INHIBITING WATER FORMED DEPOSITS WITH THRESHOLD COMPOSITIONS,

Calgon Corp., Pittsburgh, Pa. Water Management Div.
For primary bibliographic entry see Field 05D.
W73-04166

PERTINENT DATA ON SPILLWAY TINTER GATES FOR CORPS OF ENGINEERS PROJECTS,

Army Engineer Waterways Experiment Station, Vicksburg, Miss.
For primary bibliographic entry see Field 08C.
W73-04377

AUTOMATIC TREATMENT OF COOLING WATER,

Calgon Corp., Pittsburgh, Pa.
For primary bibliographic entry see Field 05D.
W73-04422

Field 08—ENGINEERING WORKS

Group 8G—Materials

DRY GRAPHITE FILM PROTECTS TREATMENT PLANT UNITS.

Public Works, Vol 103, No 1, November 1972, p 85, 2 fig.

Descriptors: *Corrosion control, Resins, Metals, Treatment facilities, *Wisconsin, Films.

Identifiers: *Graphite coating, Rust elimination, *Oak Creek (Wis).

In 1971 the Oak Creek, Wisconsin, waste water treatment facility began using a new dry-film coating to protect drive chains of out-of-service sedimentation basins. Slip-Plate No. 3, a resin-base graphite formulation, has almost totally eliminated rust and corrosion on exposed chains and fittings. It can be sprayed, rolled, brushed, flowed or dip-coated onto metal surfaces needing lubrication and protection. The dry-film coating will not flake or chip off, and resists acids, fumes and other corrosives. In addition, it will not attract or hold sand, rust, and abrasive materials. (Murphy-Texas)
W73-04444

8H. Rapid Excavation

FRIO RIVER, THREE RIVERS, TEXAS; MISSISSIPPI RIVER AT WINONA, MINNESOTA; SURVEY RESOLUTIONS.

For primary bibliographic entry see Field 06G.
W73-04463

8I. Fisheries Engineering

N SUB 2—THREAT TO PACIFIC NORTHWEST FISHERIES,

Army Engineer District, Portland, Oreg.

H. A. Smith, Jr.

Water Spectrum, Vol 4, No 2, p 41-48, 1972. 6 fig, 4 photo, 1 ref.

Descriptors: *Nitrogen, *Fish migration, *Supersaturation, *Spillways, *Fisheries, Stream fisheries, Fish management, Fish passages, Anadromous fish, Fish reproduction, Dams, Stilling basins, Chinook salmon, Trout, Bulkhead gates, Energy dissipation, Transportation, Water quality, Fish ladders, Bubbles.
Identifiers: Slotted bulkhead gates, Fishways.

Prior to 1965, few people realized that the hazard of gas bubble disease could exist in the Pacific Northwest. By 1968, studies were started to learn the effects of nitrogen supersaturation on fish. A principal cause was traced to large amounts of air being drawn into stilling basins as heavy spring flows were released. Dissolved gases from the water were transferred through gill structures to body tissues, where they were released when temperature and pressure conditions surrounding the fish altered. Fish are in danger in the upper 6 ft of water when concentrations exceed 120% of saturation. With multiple reservoirs on a stream, the supersaturated river does not fully return to equilibrium between dams before becoming recharged again. Steelhead trout, shad, and chinook and coho salmon are among varieties affected. Alleviative measures include releases through turbines instead of over spillways, multiple-orifice bulkheads to dissipate energy, flip-lips on spillways to prevent deep basin penetration of flows, and fish transportation around problem areas. (USBR)
W73-04075

PROPAGATION OF GRASS CARP AND SILVER CARP, (IN KOREAN),

Pusan Fisheries Coll. (Korea).

I-B Kim.

Bull Pusan Fish Coll (Nat Sci). Vol 10, No 1, p 33-49, 1970. Illus. English summary.

Identifiers: *Carp, *Grass carp, *Korea, Propagation (Fish), *Silver carp, Spawning.

Observations are given on results obtained by artificial spawning inducement by the use of hypophysis extracts. Recommendations are made for future fish culture at Pusan, Korea using this method.—Copyright 1972, Biological Abstracts, Inc.
W73-04261

ACCESSIBILITY OF AMINO ACIDS IN ARTIFICIAL FOOD TO POND FISH: III. ACCESSIBILITY OF AMINO ACIDS IN SOYBEAN MEAL, CASTOR OIL CAKES, WHEAT AND FOOD MIXES TO YEARLING CARP (IN RUSSIAN),

M. A. Scherbina.

Sb Nauchno-Issled Rab Vses Nauchno-Issled Inst Prudovogo Rybn Khoz. 5. p 202-220. 1970. English summary.

Identifiers: *Amino acids, *Carp, *Food, Meal, Oil, *Soybean D, Wheat M.

The accessibility of 9 irreplaceable and 6 replaceable amino acids to carp yearlings fed on soybean meal, castor oil cakes, wheat and food mixes based on these ingredients was studied by the method of inert substances. The availability of irreplaceable amino acids had a relatively higher index. Arginine was most easily separated from protein and absorbed. Threonine, in soybean meal and castor oil cake, and lysine, in the same, were the least accessible. Among the replaceable amino acids, glutamine and aspartic acid were the most accessible in the majority of cases and glycine was the least accessible.—Copyright 1972, Biological Abstracts, Inc.
W73-04309

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication AND Distribution

SALINITY PROBLEMS IN ARID LANDS IRRIGATION: A LITERATURE REVIEW AND SELECTED BIBLIOGRAPHY,

Arizona Univ., Tucson. Inst. of Arid Lands Research.

For primary bibliographic entry see Field 03C.
W73-03910

INDEXED BIBLIOGRAPHY OF THERMAL EFFECTS LITERATURE - 1,

Oak Ridge National Lab., Tenn. Nuclear Safety Information Center.

For primary bibliographic entry see Field 05C.
W73-04020

RUSSIAN RADIOECOLOGY. A BIBLIOGRAPHY OF SOVIET PUBLICATIONS WITH CITATIONS OF ENGLISH TRANSLATIONS AND ABSTRACTS,

Division of Radiological and Environmental Protection (AEC), Washington, D.C.

For primary bibliographic entry see Field 05B.
W73-04298

RADIOECOLOGY AND ECOPHYSIOLOGY OF DESERT PLANTS AT THE NEVADA TEST SITE,

California Univ., Los Angeles. Lab. of Nuclear Medicine and Radiation Biology.

For primary bibliographic entry see Field 05C.
W73-04300

INDEXED BIBLIOGRAPHY OF THERMAL EFFECTS LITERATURE - 2,

Oak Ridge National Lab., Tenn.

For primary bibliographic entry see Field 05C.
W73-04353

CONTROL OF COPPER ELECTROPLATING WASTES: AN ANNOTATED BIBLIOGRAPHY,

Vermont Univ., Burlington. Technical Information Center.

For primary bibliographic entry see Field 05G.
W73-04467

SEDIMENTATION—ANNOTATED BIBLIOGRAPHY OF FOREIGN LITERATURE FOR 1969 AND 1970, SURVEY NO 7.

For primary bibliographic entry see Field 02J.
W73-04507

10F. Preparation of Reviews

SALINITY PROBLEMS IN ARID LANDS IRRIGATION: A LITERATURE REVIEW AND SELECTED BIBLIOGRAPHY,

Arizona Univ., Tucson. Inst. of Arid Lands Research.

For primary bibliographic entry see Field 03C.
W73-03910

METHYLMERCURY, A REVIEW OF HEALTH HAZARDS AND SIDE EFFECTS ASSOCIATED WITH THE EMISSION OF MERCURY INTO NATURAL SYSTEMS,

Stockholm Univ. (Sweden). Dept. of Biochemistry.

For primary bibliographic entry see Field 05C.
W73-04127

MICROBIOLOGY OF WATER,

Environmental Protection Agency, Cincinnati, Ohio.

For primary bibliographic entry see Field 05B.
W73-04235

EFFECTS ON FRESHWATER FISH,

Washington Univ., Seattle.

For primary bibliographic entry see Field 05C.
W73-04236

MARINE AND ESTUARINE POLLUTION,

California State Coll., Long Beach.

For primary bibliographic entry see Field 05A.
W73-04237

WATER POLLUTION. FRESHWATER MACROINVERTEBRATES,

Environmental Protection Agency, Washington, D.C., Office of Water Programs.

For primary bibliographic entry see Field 05C.
W73-04238

RADIOACTIVE WASTES,

Minnesota Univ., Minneapolis.

For primary bibliographic entry see Field 05B.
W73-04239

LITERATURE SEARCH FOR ATMOSPHERIC HUMIDITY PROFILE MODELS FROM THE SEA SURFACE TO 1,000 METERS,

National Oceanographic Data Center, Rockville, Md.

For primary bibliographic entry see Field 07C.
W73-04332

A REVIEW OF THE ARSENIC CYCLE IN NATURAL WATERS,

Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering.

For primary bibliographic entry see Field 05B.
W73-04541

SUBJECT INDEX

1 5-DI-BETA-NAPHTHYLTHIOCARBAZONE	Optimizing an Activated Carbon Wastewater Treatment Plant, W73-04421	SD
Titrimetric Microdetermination of Zinc With EDTA Using 1,5-Di-Beta-Naphthylthiocarbazone (HNDZ) as an Extractive Indicator, W73-04231.		5A
2' 2' BICINCHONIC ACID		
A High-Selective Titration Method for Determining Copper with 2,2-Bicinchoninic Acid (In Russian), W73-04248		5A
2 3 5-TRIPHENYLTETRAZOLIUM CHLORIDE		
Some Observations on the Reduction of 2,3,5-Triphenyltetrazolium Chloride by Escherichia Coli, W73-04250		5B
2-AMINOQUINOLINE		
Electronic Spectra of 2-Aminoquinoline and 4-Aminoquinidine. Evidence for the Cyclic Amidine Structure of the Singly Protonated Cations, W73-04389		5A
4-AMINOQUINALDINE		
Electronic Spectra of 2-Aminoquinoline and 4-Aminoquinidine. Evidence for the Cyclic Amidine Structure of the Singly Protonated Cations, W73-04389		5A
ABSORPTION		
The Uptake of Insecticides by Freshwater Mussels and the Effects of Sublethal Concentrations of Insecticides on These Mussels, W73-03904		5C
Water Absorption by Wheat Seeds as Influenced by Hydraulic Properties of Soil, W73-04172		3F
Extraction of Anions into Chloroform by Surfactant Cations. Relevance to Dye Extraction Method of Analysis of Long Chain Amines, W73-04408		5A
ABSTRACTS		
Indexed Bibliography of Thermal Effects Literature - I, W73-04020		5C
Sedimentation-Annotated Bibliography of Foreign Literature for 1969 and 1970, Survey No 7, W73-04507		2J
ACCLIMIZATION		
Effects of Acclimation and Acute Temperature Experience on the Swimming Speed of Juvenile Coho Salmon, W73-04243		5C
ACID MINE WATER		
Acid Mine Drainage Treatment Process Termed Successful. W73-03999		SD
ACIDITY		
Electrochemical Oxygen Demand System, W73-04147		5A
ACTIVATED CARBON		
Effect of Powdered Activated Carbon on Coagulation with Alum, W73-04165		SD
Water Purification for Beverage Processing, W73-04170		5F
Optimizing an Activated Carbon Wastewater Treatment Plant,		
Reclamation and Industrial Reuse of Amarillo's Waste Water, W73-03988		SD
Studies on Purification Theories and Mechanism of Activated Sludge. (III) Similarity in Adsorption Mechanism of Activated Sludge and Charcoal,		
Studies on Purification Theories and Mechanism of Activated Sludge. (IV) Application of Purification Theories to the Activated Sludge Process, W73-03994		SD
Bioconcentration of Arsenic by Activated Sludge Biomass, W73-04124		SD
Internal Precipitation of Phosphate from Activated Sludge, W73-04131		SD
Elements of Selection for Secondary Waste Treatment Systems, W73-04287		SD
Kinetic Behavior of Mixed Populations of Activated Sludge, W73-04441		SD
The Case for Higher Rate Waste Water Treatment, W73-04445		SD
An Evaluation of Procedures for Enumerating Bacteria in Activated Sludge, W73-04450		5A
Thermal Conditioning Tests of Activated Sludge and Anaerobic Digestion Test of the Filtrates, W73-04476		SD
ADENOVIRUS		
Concentration of Reovirus and Adenovirus From Sewage and Effluents by Protamine Sulfate (Salmine) Treatment, W73-03995		SD
ADMINISTRATIVE AGENCIES		
The 1971 Tritium Symposium at Las Vegas, W73-04318		5A
ADSORPTION		
Adsorption Process Eases Acid Recovery. W73-04005		SD
Adsorption and Concentration of Dissolved Carbon-14-DDT by Coloring Colloids in Surface Waters, W73-04012		5B
AERATION		
Adjustable Drive Units Solve Seasonal Waste Water Treatment Problems. W73-04009		SD
Internal Precipitation of Phosphate from Activated Sludge, W73-04131		SD
Batch Sewage Treatment System, W73-04136		SD
Sewage Treatment System,		
Treating Liquid Waste Effluent, W73-04150		SD
Simon-Hartley-Carousel Sewage and Effluent Treatment, W73-04158		SD
AERATION PERIODS		
The Case for Higher Rate Waste Water Treatment, W73-04445		SD
AERIAL PHOTOGRAPHY		
Energy Spectra of Sea Waves from Photographic Interpretation, W73-03939		7B
Oil Slick Studies Using Photographic and Multispectral Scanner Data, W73-03945		5B
Multi-Sensor Oil Spill Detection, W73-03946		5B
AEROBIC BACTERIA		
An Evaluation of Procedures for Enumerating Bacteria in Activated Sludge, W73-04450		5A
AEROBIC CONDITIONS		
Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India, W73-04496		SD
AEROBIC TREATMENT		
Sewage Treatment Plant and Method of Treating Sewage, W73-04130		SD
Batch Sewage Treatment System, W73-04136		SD
AEROSOLS		
Study of Rainout of Radioactivity in Illinois. W73-04052		5B
Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102		5B
AESTHETICS		
Authorizing the Study of a Segment of Colorado for Possible Inclusion in the Wild Rivers System. W73-04464		6E
AFRICA		
Notes on River Habitat Use by the Larger Ungulates in the Kalahari Gemsbok National Park, W73-04273		2I
AGGLUTINATION		
Modification of Schaefer's Procedure for Serotyping of Organisms of the Mycobacterium-Intracellulare-M. Scrofulaceum Complex, W73-04398		5A
AGRICULTURAL CHEMICALS		
Pesticide Regulations and Residue Problems in Japan, W73-04042		5B
AGRICULTURE		
Conference on Beneficial Uses of Thermal Discharges. W73-04337		5G

SUBJECT INDEX

AGRICULTURE

- Agricultural and Urban Uses of Low-Temperature Heat,
W73-04349 5G
- AHMEDABAD (INDIA)**
Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India,
W73-04496 5D
- AIR CONDITIONING**
Combination Urban-Power Systems Utilizing Waste Heat,
W73-04350 5G
- AIR PERMEABILITY**
Air Permeability as Related to Particle Size and Bulk Density in Sand System,
W73-03972 2G
- AIR POLLUTION**
Large Power Plant Effluent Study (Lappes) Volume 3 - Instrumentation, Procedures, and Data Tabulations (1970),
W73-04121 5A
- Fluid Pollution Eradicator System Including an Air Bubble Scrubbing Unit,
W73-04137 5D
- Air and Water Pollution.
W73-04178 5G
- The Dose to Man from Atmospheric KR-85,
W73-04291 5B
- Environmental Surveillance at Hanford for CY-1971,
W73-04310 5A
- Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant,
W73-04311 5A
- Fallout Program Quarterly Summary Report June 1, 1972 - September 1, 1972 - An Appendix,
W73-04316 5B
- Concentration of C-14 in the Troposphere During 1953 to 1971, (In Russian),
W73-04323 5A
- AIR-WATER INTERFACES**
A Technique for the Comparison of Contact and Non-Contact Measurements of Water Surface Temperature,
W73-03948 7B
- Photogrammetry and Hydraulic Surfaces,
W73-04368 7B
- ALASKA**
Water Inflow into Hole UA-1, Anchitka Island, Alaska,
W73-03919 5A
- Electronic Detection of Serac Avalanches and Glacier Noise at Vaughan Lewis Icefall, Alaska,
W73-03929 2C
- Periodic Surge Origin of Folded Medial Moraines on Bering Piedmont Glacier, Alaska,
W73-03935 2C
- ALBERTA (CANADA)**
Water Shortage in the Forest Floor of Subalpine Forests of Alberta,
W73-04169 4A
- Thermal and Mineral Springs in the Southern Rocky Mountains of Canada,
W73-04363 4B

- ALGAE**
Ecological Factors Influencing Production of Algae in Northern Prairie Lakes,
W73-03909 5C
- Losses of 65 ZN To Inorganic Surfaces in a Marine Algal Nutrient Medium,
W73-04011 5C
- Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India,
W73-04496 5D
- 'Sun-Shade' Adaptation in Microbenthic Algae from the Oresund,
W73-04519 5C
- ALGAL CONTROL**
Ecological Factors Influencing Production of Algae in Northern Prairie Lakes,
W73-03909 5C
- ALGERIA**
Hydrologic Studies in Northern Algeria (O hidrologicheskoy i zuchennosti territorii Severnogo Alzirza),
W73-04120 2E
- ALKYLENE BIS HALIDES**
Use of Potassium Phthalimide for Identification of Alkylene Bis Halides and Bis Sulfonates,
W73-04416 5A
- ALKYLENE BIS SULFONATES**
Use of Potassium Phthalimide for Identification of Alkylene Bis Halides and Bis Sulfonates,
W73-04416 5A
- ALLUVIAL CHANNELS**
Statistical Properties of Missouri River Bed Forms,
W73-04365 8B
- ALTERNATIVE COSTS**
Regional Development of Public Water Supply Systems,
W73-04064 3D
- ALTERNATIVE WATER USE**
Regional Development of Public Water Supply Systems,
W73-04064 3D
- ALTITUDE**
Calculation of Areal Rainfall Using Finite Element Techniques with Altitudinal Corrections,
W73-04385 7C
- ALUM**
Researches on Removal of Colloidal Matter From Waste Water Produced in Sanitary Porcelain Ware and Ceramic Industry,
W73-03990 5D
- Effect of Powdered Activated Carbon on Coagulation with Alum,
W73-04165 5D
- AMALGAM**
Influence of Amalgam Formation on Cyclic Voltammetry,
W73-04410 5A
- AMARILLO (TEX)**
Reclamation and Industrial Reuse of Amarillo's Waste Water,
W73-03988 5D
- AMINES**
Extraction of Anions into Chloroform by Surfactant Cations. Relevance to Dye Extraction Method of Analysis of Long Chain Amines,
W73-04408 5A

- AMINO ACIDS**
Accessibility of Amino Acids in Artificial Food To Pond Fish: III. Accessibility of Amino Acids in Soybean Meal, Castor Oil Cakes, Wheat and Food Mixes to Yearling Carp (In Russian),
W73-04309 8I
- AMOEBA**
Temperature Tolerance of Pathogenic and Non-pathogenic Free-Living Amoebas,
W73-04330 5C
- ANAEROBIC DIGESTION**
Control of the Anaerobic Digestion Process and Supporting Unit Processes,
W73-04430 5D
- Thermal Conditioning Tests of Activated Sludge and Anaerobic Digestion Test of the Filtrates,
W73-04476 5D
- ANALYTICAL TECHNIQUES**
The Structure of Liquid Water,
W73-03903 2K
- On the Correlation of the Total Precipitable Water in a Vertical Column and Absolute Humidity at the Surface,
W73-03923 2B
- Microwave Emission From Snow--A Progress Report,
W73-03950 7B
- Concentration of Reovirus and Adenovirus From Sewage and Effluents by Protamine Sulfate (Salmine) Treatment,
W73-03995 5D
- Brucine Analysis for High Nitrate Concentrations,
W73-04000 5A
- Trace-Metal Analysis Using Atomic Absorption Spectrophotometry,
W73-04043 5A
- Mercury in the Environment - Techniques of Analysis (XIII. Analysetechniken voor Kwik in Het Milieu),
W73-04046 5A
- Sources of Error and Confirmation in the Determination of Methylmercury Radicals,
W73-04050 5A
- Activation Analysis of Mercury and Other Environmental Pollutants in Water and Aquatic Ecosystems,
W73-04051 5A
- Numerical Modeling of the Growth of Ice Crystals, Graupel, and Hail,
W73-04104 2C
- Mercury Detection by Means of Thin Gold Films,
W73-04123 5A
- On the State of Mercury (II) Traces in Aqueous Solutions - Colloidal Behavior of Mercury,
W73-04126 5A
- Survey of Analytical Spectral Data Sources and Related Data Compilation Activities,
W73-04244 5A
- A Method of Collecting Periphyton in Lentic Habitats with Procedures for Subsequent Sample Preparation and Quantitative Assessment,
W73-04270 2L

SUBJECT INDEX

ASIA

An Investigation into the Determination of Plutonium in Soil by a Fusion Procedure, W73-04295	5B	Paleomagnetic Studies of Bottom Sediments from the Indian Ocean Area of the Antarctic (Paleomagnitnyye issledovaniya donnykh otlozhennykh Indiyskogo sektora Antarktiki), W73-04516	2J	AQUIFER CHARACTERISTICS Sensitivity of Groundwater Flow Models to Vertical Variability of Aquifer Constants, W73-04065	2F
Sources of Water Pollution Established by Using a Neutron Activatable Tracer, W73-04326	5B	APPALACHIAN MOUNTAIN REGION Predicting Soil Moisture in the Southern Appalachians, W73-04086	2G	Ground Water Reconnaissance in the Arghandab River Basin Near Kandahar, Afghanistan, W73-04379	4B
Activation Analysis Trace-Element Studies for Marine Biological Samples, W73-04327	5A	APPLICATION METHODS Trickle Irrigation....A More Efficient Means of Water Management, W73-03953	3C	Ground Water in the Plaquemine-White Castle Area, Iberville Parish, Louisiana, W73-04502	4B
Nuclear Activation Analysis of Se, As, Zn, Cd, and Hg in Environmental Matrices, W73-04328	5A	Starting with Trickle Irrigation, W73-03958	3C	Construction of Waste-Injection Monitor Wells Near Pensacola, Florida, W73-04536	5E
Activation analysis of Heavy Metals in Surface Water Using Ion Exchange Filter Paper and Cyanide Complexing, W73-04329	5A	APPROXIMATION METHODS Streamflow Routing (With Applications to North Carolina Rivers), W73-03908	4A	ARCHITECTURE A Matter of Design, W73-04030	6C
Miniature On-Line Digital Computer for Multipurpose Applications. Applications to Kinetic Analyses, W73-04387	7C	AQUATIC ALGAE Algal Assay Procedure, W73-04404	5A	ARCTIC Remote Sensing of the Arctic Ice Environment, W73-03938	7B
Analytical Technique May Cut Oil Spills, W73-04429	5G	AQUATIC ANIMALS Concentration Factors of Chemical Elements in Edible Aquatic Organisms, W73-04125	5C	ARID LANDS The Spottiness of Rainfall in a Desert Area, W73-04532	2B
Measurements of Movements of Solid Substances in Water by Means of Stable Tracers and Activation Analysis, W73-04490	5B	Biological Limitations on the Use of Waste Heat in Aquaculture, W73-04342	5G	ARIZONA Hydrologic Regimen of Lower Tonto Creek Basin, Gila County, Arizona—A Reconnaissance Study, W73-04099	3B
Use of New Glacier Investigation Techniques in Antarctica (Primenenie novykh metodov gletsiologicheskikh issledovanii v Antarktide), W73-04509	2C	AQUATIC HABITATS Marine Life in the Morro Bay Power Plant Discharge Canal, W73-04031	5C	AROMATIC COMPOUNDS Reduction of Aromatic Fluorine Compounds, W73-04412	5B
Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'zovaniya lazerov dlya issledovaniya dinamiki lednikoviykh pohrovov), W73-04510	2C	AQUATIC PLANTS Concentration Factors of Chemical Elements in Edible Aquatic Organisms, W73-04125	5C	ARSENATE Bacterial Reduction of Arsenate in Sea Water, W73-04479	5B
ANDES (PERU) The Pleistocene Moraine Stages of West-Central Peru, W73-03931	2C	AQUEOUS SOLUTIONS The Structure of Liquid Water, W73-03903	2K	ARSENIC Bioconcentration of Arsenic by Activated Sludge Biomass, W73-04124	5D
ANDOVER (U.K.) Andover Sewage-Treatment Works, W73-04439	5D	A Rapid Method of Measurement of Diffusion Coefficients in Aqueous Solutions, W73-03966	2K	ARSENIC COMPOUNDS Bacterial Reduction of Arsenate in Sea Water, W73-04479	5B
ANIMAL METABOLISM A Temperature-Induced Transition in Mitochondrial Oxidation: Contrasts Between Cold and Warm-Blooded Animals, W73-04027	5C	Titrimetric Microdetermination of Zinc With EDTA Using 1,5-Di-Beta-Naphthylthiocarbazone (HNDZ) as an Extractive Indicator, W73-04231	5A	A Review of the Arsenic Cycle in Natural Waters, W73-04541	5B
ANION EXCHANGE Anion Exclusion Effects on Chloride Movement in Soils, W73-03973	2K	Rapid Separation of Metal Chelates by Column Liquid-Liquid Chromatography using Ultraviolet Detection, W73-04391	5A	ARSENIC UPTAKE Bioconcentration of Arsenic by Activated Sludge Biomass, W73-04124	5D
ANION EXCLUSION Anion Exclusion Effects on Chloride Movement in Soils, W73-03973	2K	High Sensitivity Thermochemical Analysis, W73-04420	7B	ARTIFICIAL LAKES Hydrologic Aspects of Freshening Upper Old Tampa Bay, Florida, W73-04094	2H
ANTARCTIC Growth Form and Water Relations of Mosses in the Maritime Antarctic, W73-04259	2C	Some Coordination Effects in Natural Waters of Ethiopia, W73-04529	2K	ARTIFICIAL RECHARGE Thermal Pollution of Ground Water by Artificial Recharge, W73-04038	5B
Use of New Glacier Investigation Techniques in Antarctica (Primenenie novykh metodov gletsiologicheskikh issledovanii v Antarktide), W73-04509	2C	AQUICULTURE Mariculture in Japan Using Heated Effluent Water, W73-04340	5G	Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin, W73-04277	6D
		Biological Limitations on the Use of Waste Heat in Aquaculture, W73-04342	5G	Wastewater Reclamation by Irrigation, W73-04480	5D
				ASIA Some Generalized Characteristics of the Floods and Droughts of the Lower Mekong, W73-04380	2E

SUBJECT INDEX

ASPHALT

ASPHALT Water Use Efficiency of Vegetable Crops Grown over Asphalt Moisture Barriers, W73-03902

Comparison of Recharge to Groundwater Under Pasture and Forest Using Environmental Tritium, W73-04373

BACTERIA

Liquid Treatment Method, W73-04138

SD

ASPHALT MOISTURE BARRIER

Water Use Efficiency of Vegetable Crops Grown over Asphalt Moisture Barriers, W73-03902

Water Table Fluctuations Under Forest and Pasture in a Karstic Region of Southern Australia, W73-04374

BACTERIA

Incidence of Prosthecate Bacteria in a Polluted Stream, W73-04265

SB

ASSAY

Radiocarbon in the Sea, W73-04292

AUTOMATIC CONTROL

Center Pivot Irrigation, W73-03978

An Evaluation of Procedures for Enumerating Bacteria in Activated Sludge, W73-04450

SA

Shallow-Water Strontium-90 Anomaly About the Antilles Arc-1970, W73-04293

New, Directly Digital Automatic Titration Apparatus, W73-04252

Control of Growth Rate by Initial Substrate Concentration at Values Below Maximum Rate, W73-04499

SC

Strontium-90 in the Great Lakes: Concentration-Time Model, W73-04296

Automatic Designing of Transmission Lines and Substations, W73-04079

BACTERIAL REDUCTION

Bacterial Reduction of Arsenate in Sea Water, W73-04479

SB

Activation Analysis Trace-Element Studies for Marine Biological Samples, W73-04327

Survey of Analytical Spectral Data Sources and Related Data Compilation Activities, W73-04244

BACTERICIDES

Treating Liquid Waste Effluent, W73-04150

SD

Nuclear Activation Analysis of Se, As, Zn, Cd, and Hg in Environmental Matrices, W73-04328

New, Directly Digital Automatic Titration Apparatus, W73-04252

BACTERIOPHAGE

Evaluation of Herbicides for Possible Mutagenic Properties, W73-04233

SC

ATLANTIC OCEAN

Fallout Program Quarterly Summary Report June 1, 1972 - September 1, 1972 - An Appendix, W73-04316

Automatic Sorting of Infrared Spectra, W73-04413

BAFFLES

Fluid Pollution Eradicator System Including an Air Bubble Scrubbing Unit, W73-04137

SD

ATMOSPHERE

Atmospheric Water Collector, W73-04149

Control of the Anaerobic Digestion Process and Supporting Unit Processes, W73-04430

BAFFLES

Method and Apparatus for Clarifying Liquids, W73-04152

SD

LITERATURE SEARCH FOR ATMOSPHERIC HUMIDITY PROFILE MODELS FROM THE SEA SURFACE TO 1,000 METERS

W73-04332

Water Treatment Plant for Today and Tomorrow, W73-04435

BALTIMORE GAS AND ELECTRIC CO

The Nuclear Plant Controversy - II: Power and Hot Water, W73-04023

SC

ATMOSPHERIC HUMIDITY

Reduction of Atmospheric Toluene Diisocyanate by Water Vapor, W73-04184

Direct Filtration an Economic Answer to Water Treatment Needs, W73-04446

BANK PROTECTION

Report of the Chief of Engineers to the Secretary of the Army on a Study of Streambank Erosion in the United States, W73-04473

6E

ATMOSPHERIC MOISTURE

Atmospheric Water Collector, W73-04149

Award Winning Water Treatment Plant Features Automation, W73-04447

BARLEY-M

Stomatal Conductance of Differentially Salinized Plants, W73-04181

3C

ATOMIC ABSORPTION SPECTROPHOTOMETRY

Trace-Metal Analysis Using Atomic Absorption Spectrophotometry, W73-04043

Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries, W73-04063

BASE FLOW

Sensitivity of Groundwater Flow Models to Vertical Variability of Aquifer Constants, W73-04065

2F

ATTOMETERS

A Survey of Attitudes Towards the Mississippi River as a Total Resource in Minnesota, W73-03905

Available Water Capacity of Sandy and Gravelly North Dakota Soils, W73-04109

BASELINE STUDIES

Hydrologic Aspects of Freshening Upper Old Tampa Bay, Florida, W73-04094

2H

ATPASE

Inhibition of Oligomycin-Sensitive and -Insensitive Magnesium Adenosine Triphosphate Activity in Fish by Polychlorinated Biphenyls, W73-04176

Finite-Element Stress Analysis of Avalanche Snowpacks, W73-03928

AVAILABILITY

Effects of Soil Texture on Evaporative Loss and Available Water in Semi-Arid Climates, W73-03952

2D

ATTITUDES

Data Record for Public Attitudes Toward Reuse of Reclaimed Water, W73-04059

Electronic Detection of Serac Avalanches and Glacier Noise at Vaughan Lewis Icefall, Alaska, W73-03929

AVALANCHES

2C

BACILLUS STEAROTHERMOPHILUS

Studies on Variants of *Bacillus Stearothermophilus* Strain NCA 1518, W73-04246

2C

BASIN RESPONSE (CHANGE)

Selection of Test Variable for Minimal Time Detection of Basin Response to Natural or Induced Changes, W73-04061

4A

AUSTRALIA

Australian Sirotherm Process Removes Salt from Brackish Water, W73-04285

5A

BATHYMETRY

Bathymetric Reconnaissance of Mariette and Spooner Lakes, Washoe County and Carson City, Nevada, W73-04100

7C

SUBJECT INDEX

BIOLOGICAL LIMITATIONS

Bathymetric Reconnaissance of Topaz Lake, Nevada and California, W73-04192	7C	BEHAVIOR Data Record for Public Attitudes Toward Reuse of Reclaimed Water, W73-04059	6B	Sedimentation--Annotated Bibliography of Foreign Literature for 1969 and 1970, Survey No 7, W73-04507	2J
Bathymetric Reconnaissance of Rye Patch Reservoir and the Pitt-Taylor Reservoirs, Pershing County, Nevada, W73-04227	7C	BELT PRESS Sludge Dewatering Tests with a Belt Press, W73-04432	5D	Planning for Coastal Ports on a Systems Basis: Preliminary Methodological Design, W73-04525	8A
BAY OF FUNDY Tidal Energy From the Bay of Fundy, W73-04041	8A	BEN NESIN LABORATORY Trace-Metal Analysis Using Atomic Absorption Spectrophotometry, W73-04043	5A	BIO-GAS The BIO-Gas Plant: Generating Methane from Organic Wastes, W73-04157	5G
BAYS Hydrographic Observations in Tampa Bay, Florida--1969, W73-03926	5A	BENCH INDEX (FLOOD STAGE) A Comparison of Morphometric Measures of Bankfull, W73-04375	2E	BIOASSAY Algal Assay Procedure, W73-04404	5A
Sedimentation on Shell Banks in Delaware Bay, W73-04226	2L	BENDS (HYDRAULIC) Estimating Discharge from Superelevation in Bends, W73-04219	8B	BIOCHEMICAL OXYGEN DEMAND Treating Liquid Waste Effluent, W73-04150	5D
BEACH EROSION Floatable Breakwater Element, W73-04153	8A	BENTHIC FAUNA Stream Faunal Recovery After Manganese Strip Mine Reclamation, W73-04546	5C	Effect of Turbulence on BOD Testing, W73-04443	5D
Regional Inventory Report--South Atlantic-Gulf Region, Puerto Rico and the Virgin Islands, W73-04228	8B	BENTHOPELOLOGIC FISH Mercury Concentration in Recent and Ninety-Year-Old Benthoepelagic Fish, W73-04122	5B	BIOCHEMICAL TESTS Some Observations on the Reduction of 2,3,5-Triphenyltetrazolium Chloride by Escherichia Coli, W73-04250	5B
Tybee Island, Georgia; Galveston Harbor, Texas, W73-04452	6E	BENZAPYRENE Navigation as One Source of Pollution of Water Basins by Carcinogenic Hydrocarbons (In Russian), W73-04186	5B	BIOCIDE ENTRAINED PHYTOPLANKTON Cooling Water Chlorination and Productivity of Entrained Phytoplankton, W73-04427	5F
BEACHES Floatable Breakwater Element, W73-04153	8A	BERING PIEDMONT GLACIER (ALA) Periodic Surge Origin of Folded Medial Moraines on Bering Piedmont Glacier, Alaska, W73-03935	2C	BIOCONCENTRATION Bioconcentration of Arsenic by Activated Sludge Biomass, W73-04124	5D
Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniiu morskikh beregov. 13-21 sentyabrya 1971 g. Palanga-Nida. Tezisy dokladov), W73-04514	2J	BERKSHIRE COUNTY (MASS) An Inventory of the Ponds, Lakes and Reservoirs of Massachusetts, Berkshire and Franklin Counties, W73-04069	2H	BIOFILTRATION Andover Sewage-Treatment Works, W73-0439	5D
BEAN-D Stomatal Conductance of Differentially Salinized Plants, W73-04181	3C	BEVERAGE PROCESSING Water Purification for Beverage Processing, W73-04170	5F	BIOINDICATORS Microbiology of Water, W73-04235	5B
Investigations on the Water Uptake of Cracking and Noncracking Cotyledons of Bean Seeds (<i>Phaseolus vulgaris</i> L.) (In German), W73-04301	3F	BIBLIOGRAPHIES Salinity Problems in Arid Lands Irrigation: A Literature Review and Selected Bibliography, W73-03910	3C	Marine and Estuarine Pollution, W73-04237	5A
BEARING STRENGTH Penetration of Free-Falling Objects Into Deep-Sea Sediments, W73-04195	2J	Indexed Bibliography of Thermal Effects Literature - 1, W73-04020	5C	Microbes as Tracers of Water Movement, W73-04392	5B
BEAUMONT LEYS Leading Question, W73-04017	5D	Russian Radioecology. A Bibliography of Soviet Publications with Citations of English Translations and Abstracts, W73-04298	5B	Toxic Effects of the Mycotoxins Aflatoxin B1, Rubratoxin B, Patulin, and Diacetoxyscirpenol on the Crustacean Cyclops fuscus, W73-04395	5C
BED LOAD Bagnold Approach and Bed-Form Development, W73-04217	8B	Radioecology and Ecophysiology of Desert Plants at the Nevada Test Site, W73-04300	5C	BIOLOGICAL ACCUMULATION FACTOR Mercury in Fish - Total Content in Freshwater and Marine Fishes (VII. (Totaal) Kwikgehalte van Zoutwateren Zeevis), W73-04044	5C
Statistical Properties of Missouri River Bed Forms, W73-04365	8B	Indexed Bibliography of Thermal Effects Literature - 2, W73-04353	5C	BIOLOGICAL COMMUNITIES Factors of Ecologic Succession in Oligotrophic Fish Communities of the Laurentian Great Lakes, W73-04399	5C
BEECH-D Concerning Conservation of the Hohe Mark Forest Massif and of the High Valleys of the Schwalm and Its Tributaries at Elsenborn, W73-04523	6G	Control of Copper Electroplating Wastes: An Annotated Bibliography, W73-04467	5G	Loch Lomond: Man's Effects on the Salmonid Community, W73-04407	5C
				BIOLOGICAL LIMITATIONS Biological Limitations on the Use of Waste Heat in Aquaculture, W73-04342	5G

SUBJECT INDEX

BIOLOGICAL MATERIALS

BIOLOGICAL MATERIALS

An Atomic Absorption Method for Cation Measurements in Kjeldahl Digests of Biological Materials, W73-04251 5A

BIOLOGICAL PROPERTIES

Studies on Variants of Bacillus Stearothermophilus Strain NCA 1518, W73-04246 5A

BIOLOGICAL SAMPLES

Vanadium Determination in Biological Materials at Nanogram Levels by a Catalytic Method, W73-04409 5A

BIOLOGICAL TREATMENT

Acid Mine Drainage Treatment Process Termed Successful, W73-03999 5D

Sewage Treatment Plant and Method of Treating Sewage, W73-04130 5D

Liquid Treatment Method, W73-04138 5D

Wastewater Treatment Sequence, W73-04146 5D

Treating Liquid Waste Effluent, W73-04150 5D

Elements of Selection for Secondary Waste Treatment Systems, W73-04287 5D

BIOMASS

The Instability of Ocean Populations, W73-04240 5C

BIOMETHYLATION

Birds Give Warning, W73-04049 5C

BIRDS

Birds Give Warning, W73-04049 5C

BLACK LIQUORS

Inline Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment, W73-04161 5D

BLACK RIVER ESTUARY (SC)

A Reconnaissance of the Winyah Bay Estuarine Zone, South Carolina, W73-04095 7C

BLANCHING PROCESS

Reduces Effluent from Blanching, W73-04163 5D

BLOWDOWN

Reclaiming Cooling Tower Blowdown, W73-04040 5D

BOILING POINT

Relation Between Retention Indices and Boiling Points of Hydrocarbons Differing Slightly in Their Vapor Pressures, W73-04417 5A

BORDER IRRIGATION

Soil Air Pressure and Water Infiltration Under Border Irrigation, W73-04087 2G

BOREAL

New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin

(Novyye dannyye o diatomovykh vodoroslyakh otlozhennii boreal'noy transgressii v basseyne r. Vagi), W73-04517 2J

BORON

A Computer Analysis on the Leaching of Boron From Stratified Soil Columns, W73-03967 2G

BOTTOM SEDIMENTS

Penetration of Free-Falling Objects Into Deep-Sea Sediments, W73-04195 2J

Sedimentation on Shell Banks in Delaware Bay, W73-04226 2L

Depositional Patterns, Facies, and Trace Element Accumulation in the Waukegan Member of the Late Pleistocene Lake Michigan Formation in Southern Lake Michigan, W73-04361 2J

Paleomagnetic Studies of Bottom Sediments from the Indian Ocean Area of the Antarctic (Paleomagnitnyye issledovaniya donnykh otlozhennyi Indiyskogo sektora Antarktiki), W73-04516 2J

The Clay Mineralogy and Some Properties of Bottom Sediments of the St. Lawrence River Near Kingston, Ontario, W73-04538 2J

BOUNDARIES (SURFACES)

Texas Seashore Boundary Law: The Effect of Natural and Artificial Modifications, W73-04460 6E

BOUNDARY DISPUTES

Texas Seashore Boundary Law: The Effect of Natural and Artificial Modifications, W73-04460 6E

BOUNDARY LAYERS

Use of Surface Observations in Boundary-Layer Analysis, W73-04333 7C

BREAKWATERS

Floatable Breakwater Element, W73-04153 8A

BREWERY EFFLUENTS

Recovers Salable Products from Waste Yeast, W73-04014 5D

BRINE DISPOSAL

Reconditions Brine to Cut Pollution, W73-04160 5D

BRINES

Reconditions Brine to Cut Pollution, W73-04160 5D

RED SEA DRILLINGS

Red Sea Drillings, W73-04193 2J

BRITISH COLUMBIA (CANADA)

Thermal and Mineral Springs in the Southern Rocky Mountains of Canada, W73-04363 4B

BROMEGRASS

Effect of Nitrogen Source on Corn and Bromegrass Production, Soil pH, and Inorganic Soil Nitrogen, W73-04173 3F

BROMINE

Evaluation of Treatment Plants by Tracer Methods. Annual Report, Jan. 1971-Jan. 1972, W73-04297 5B

SPECIES IDENTIFICATION

in VISIBLE-ULTRAVIOLET Vapor, W73-04418 5A

BRUCINE

Brucine Analysis for High Nitrate Concentrations, W73-04000 5A

BUCKWHEAT-D

Nutritional and Water Requirements of Buckwheat, W73-04268 3F

BUDGETING

River Basin Monetary Authorizations—1969, Chesapeake Bay Basin in Comprehensive Study, W73-04454 6B

BUFFALO LAKE (TEXAS)

Buffalo Lake Recreational Water Quality: A Study in Bacteriological Data Interpretation, W73-04162 5B

BUILDINGS

A Matter of Design, W73-04030 6C

BULK DENSITY

Air Permeability as Related to Particle Size and Bulk Density in Sand System, W73-03972 2G

C-14-DDT

Adsorption and Concentration of Dissolved Carbon-14-DDT by Coloring Colloids in Surface Waters, W73-04012 5B

CADMIUM

Factors Affecting Plant Uptake and Phytotoxicity of Cadmium Added to Soils, W73-04058 5B

CALCAREOUS DEPOSITION

Geological and Archaeological Investigation of the Mode of Origin of the Marshes in Nordfriesland (Germany), (In German), W73-04229 2L

CALCIUM

Soil Hydraulic Conductivity and Bulk Volume Changes During Cyclic Calcium-Sodium Exchange, W73-03965 2K

The Concentration of K, Ca, and Mg in the Saturation Extract in Relation to Exchangeable K, Ca, and Mg, W73-03970 2K

The Effect of Electrolyte Composition on Hydraulic Conductivity of Certain Texas Soils, W73-03986 2G

CALIBRATIONS

Field Measurement of Soil Water Potential With Thermocouple Psychrometers, W73-04105 2G

CALIFORNIA

Recent Sediments of the Central California Continental Shelf, Pigeon Point to Sand Hills Bluffs: Part B. Mineralogical Data, W73-03922 2J

SUBJECT INDEX

CHANNEL IMPROVEMENT

Waste Water Reuse-A Supplemental Supply,		CAPITAL COSTS	
W73-03987	5D	Optimizing an Activated Carbon Wastewater Treatment Plant,	
Marine Life in the Morro Bay Power Plant Discharge Canal,		W73-04421	5D
W73-04031	5C	CARBOHYDRATES	
Data Record for Public Attitudes Toward Reuse of Reclaimed Water,		Dried Animal Waste as a Protein Supplement for Sheep,	
W73-04059	6B	W73-04449	5E
Bathymetric Reconnaissance of Topaz Lake, Nevada and California,		CARBON	
W73-04192	7C	Radiocarbon in the Sea,	
Marina Del Rey: A Study of Environmental Variables in a Semi-Enclosed Coastal Water,		W73-04292	5B
W73-04197	5B	Concentration of C-14 in the Troposphere During 1953 to 1971, (In Russian),	
Elevation Changes Due to Tides, Long Beach, Calif.,		W73-04323	5A
W73-04369	4B	CARBONATES	
Former Camp Parks Sewage Disposal Plant, Parcel A-2 Pleasanton, California (Final Environmental Impact Statement).		The Chemical History of Some Spring Waters in Carbonate Rocks,	
W73-04474	5G	W73-03959	5B
CANADA		CARCINOGENIC HYDROCARBONS	
Survey of the Rusty Glacier Area, Yukon Territory, Canada, 1967-70,		Navigation as One Source of Pollution of Water Basins by Carcinogenic Hydrocarbons (In Russian),	
W73-03932	2C	W73-04186	5B
The Morphological Effects of Surges of the Donjek Glacier, St Elias Mountains, Yukon Territory, Canada,		CARIBBEAN SEA	
W73-03934	2C	Shallow-Water Strontium-90 Anomaly About the Antilles Arc-1970,	
Geographical Variations in Yield-Weather Relationships Over A Large Wheat Growing Region,		W73-04293	5B
W73-04171	3F	Stable Element Concentrations and Estimations of the Radionuclide Contents in the Fish and Invertebrates Sampled from the Waters Adjacent to Panama and Columbia,	
Thermal and Mineral Springs in the Southern Rocky Mountains of Canada,		W73-04307	5C
W73-04363	4B	Characterization of the Sediments from the Tuira and Sabana River Estuaries,	
A Sampling Scheme for Shallow Snowpacks,		W73-04308	5C
W73-04386	7B	CARP	
CANAL CONSTRUCTION		Propagation of Grass Carp and Silver Carp, (In Korean),	
Stable Element Concentrations and Estimations of the Radionuclide Contents in the Fish and Invertebrates Sampled from the Waters Adjacent to Panama and Columbia,		W73-04261	8I
W73-04307	5C	Accessibility of Amino Acids in Artificial Food To Pond Fish: III. Accessibility of Amino Acids in Soybean Meal, Castor Oil Cakes, Wheat and Food Mixes to Yearling Carp (In Russian),	
Characterization of the Sediments from the Tuira and Sabana River Estuaries,		W73-04309	8I
W73-04308	5C	CARPATHIAN MOUNTAINS	
CANAL-LAKE COOLING SYSTEM		Particle Size of Mudflows on Carpathian Rivers in the Ukraine (Granulometricheskiy sostav selevykh otlozheniy na rekakh Ukrainskikh Karpat),	
An Independent View of the Use of Thermal Power Station Cooling Water to Supplement Inter-Regional Water Supply,		W73-04119	2E
W73-04346	5G	CARRIER GAS	
CANDY PLANT WASTES		Mercury Detection by Means of Thin Gold Films,	
Pollution Control Briefs.		W73-04123	5A
W73-03998	5D	CASCADIA BASIN	
CANONICAL CORRELATION ANALYSIS		Analysis of Turbidite Correlation in Cascadia Basin, Northeast Pacific Ocean,	
Using Canonical Correlation for Hydrological Predictions,		W73-04249	5B
W73-04381	2E	CATALYSTS	
CAPILLARY SUCTION		Vanadium Determination in Biological Materials at Nanogram Levels by a Catalytic Method,	
Investigation of the Possibility of Artificial Control of the Rate of Evaporation from Soils (In Russian),		W73-04409	5A
W73-04013	2D	CATFISHES	
		Catfish Farming - Beneficial Use of Waste Heat,	
		W73-04341	5G
		CATHODES	
		Determination of a Water Table in a Soil Profile Using the Platinum Oxygen Cathode,	
		W73-03985	2G
		CATIONS	
		An Atomic Absorption Method for Cation Measurements in Kjeldahl Digests of Biological Materials,	
		W73-04251	5A
		CENSUS	
		An Inventory of the Ponds, Lakes and Reservoirs of Massachusetts, Berkshire and Franklin Counties,	
		W73-04069	2H
		Regional Inventory Report-South Atlantic-Gulf Region, Puerto Rico and the Virgin Islands.	
		W73-04228	8B
		CENTER PIVOT IRRIGATION	
		Center Pivot Irrigation,	
		W73-03978	3F
		CENTRIFUGATION	
		Liquid and Sludge Treatment,	
		W73-04143	5D
		Separation of Activated Sludge from Mixed Liquor Using a Continuous Centrifuge,	
		W73-04431	5D
		CERAMICS	
		Researches on Removal of Colloidal Matter From Waste Water Produced in Sanitary Porcelain Ware and Ceramic Industry,	
		W73-03990	5D
		CERIUM	
		Observations of Radiouranium and Radiocerium Isotopic Activity Ratios in Rain Water,	
		W73-04313	5A
		Behavior of CS-137 and Ce-144 in the Sorption System Sea Water-Sediment,	
		W73-04324	5A
		CESIUM	
		Behavior of CS-137 and Ce-144 in the Sorption System Sea Water-Sediment,	
		W73-04324	5A
		CHANNEL FLOW	
		Streamflow Routing (With Applications to North Carolina Rivers),	
		W73-03908	4A
		Amplification Criterion of Gradually Varied, Single Peaked Waves,	
		W73-04097	8B
		CHANNEL IMPROVEMENT	
		Model Studies of Navigation Improvements, Columbia River Estuary: Report 2, Section 3, Fixed-Bed Studies of Disposal Areas C and D,	
		W73-03915	8B
		Tybee Island, Georgia; Galveston Harbor, Texas.	
		W73-04452	6E
		Murrells Inlet, South Carolina: Northport Harbor, Wisconsin.	
		W73-04453	6E
		A Study of the Need for and Feasibility of a Program for the Removal and Disposal of Drift and Other Debris, Including Abandoned Vessels, from the Public Harbors and Associated	

CHANNEL IMPROVEMENT**SUBJECT INDEX**

Channels Under the Jurisdiction of the Department of the Army.	8A	Use of Potassium Phthalimide for Identification of Alkyline Bis Halides and Bis Sulfonates.	5A	CHLORIDES
W73-04455		W73-04416		Anion Exclusion Effects on Chloride Movement in Soils.
Frio River, Three Rivers, Texas; Mississippi River at Winona, Minnesota; Survey Results.	6G	CHEMICAL DEGRADATION	2K	W73-03973
W73-04463		Line Source Distributions in Two Dimensions: Applications to Water Quality.	5B	CHLORINATED HYDROCARBON PESTICIDES
		W73-04201		Adsorption and Concentration of Dissolved Carbon-14-DDT by Coloring Colloids in Surface Waters.
		CHEMICAL FIXATION	2K	W73-04012
		New Process May Solve Utility Waste Problem.	5D	Thin Layer Chromatographic Detection of Chlorinated Hydrocarbons as Cross-Contaminants in Pesticide Formulations.
		W73-04283		W73-04396
CHANNEL MORPHOLOGY		CHEMICAL PROPERTIES	5A	CHLORINATION
Bagnold Approach and Bed-Form Development,	8B	Dynamics of the Water and Chemical Properties of Typical and Podzolized Brown Forest Soils in the Maritime Territory (In Russian).	2G	Cooling Water Chlorination and Productivity of Entrained Phytoplankton.
W73-04217		W73-03955		W73-04427
Statistical Properties of Missouri River Bed Forms.	8B	CHEMICAL REACTIONS	5A	CHLORINE
W73-04365		Use of Potassium Phthalimide for Identification of Alkyline Bis Halides and Bis Sulfonates.	5A	A Comparative Study of the Inactivation of Viruses in Water by Chlorine.
		W73-04416		W73-03991
A Comparison of Morphometric Measures of Bankfull,	2E	CHEMICAL TREATMENT	5F	
W73-04375		Cooling Water Treatment-Where Do We Stand,	5D	Cooling Water Chlorination and Productivity of Entrained Phytoplankton.
		W73-04016		W73-04427
CHANNELING		Electrochemical Oxygen Demand System,	5A	CHOLERA
Environmental Defense Fund, Inc. V. Corps of Engineers of the United States Army (ADEQUACY of Environmental Impact Statement).	6E	W73-04147		A Shellfish-Borne Cholera Outbreak in Malaysia.
W73-04471		CHEMICAL WASTES	5C	W73-04182
		Adsorption Process Eases Acid Recovery.	5D	CHROMIUM
		W73-04005		Reduction of Chromate by Zinc at Constant pH's. Chemistry of Chromate Treatment (Part 2) (In Japanese),
CHANNELS		Handling and Disposal of Chemical Wastes,	5D	W73-04282
Effects of Proposed Runway Extensions at Laguardia Airport on Tides, Currents, Shoaling, and Dye Dispersion.	8B	W73-04008		5D
W73-04096		Waste Acid to be Recovered and Refused.	5D	CHROMIUM REMOVAL
		W73-04015		Tannery Effluents and Their Treatment - Part I,
CHARCOAL		CHERNOZEM	5D	W73-04550
Studies on Purification Theories and Mechanism of Activated Sludge. (III) Similarity in Adsorption Mechanism of Activated Sludge and Charcoal,	5D	Structural Composition and Nutrient Status of Calcareous Chernozem in Crop Rotation, (In Russian),	3F	CIRCUIT BREAKERS
W73-03993		W73-04224		Environmental Aspects of High Voltage Substations,
		CHERNOZEMS	2G	W73-04080
CHATKAL RANGE (USSR)		Agrophysical Characteristics of Ordinary Chernozems in Eastern Kazakhstan, (In Russian),	2G	8C
Mountain Meadow Steppe Soils of the Chatkal Range (In Russian),	2G	W73-03996		CIVIL DEFENSE
W73-04164		CHESAPEAKE BAY	5A	Observations of Radioruthenium and Radioisotope Isotopic Activity Ratios in Rain Water,
		The Nuclear Plant Controversy - II: Power and Hot Water,	5C	W73-04313
CHEMICAL ANALYSIS		W73-04023		5A
Water Inflow into Hole UA-1, Amchitka Island, Alaska,	5A	River Basin Monetary Authorizations-1969, Chesapeake Bay Basin in Comprehensive Study.	6E	CLASSIFICATION
W73-03919		W73-04454		Some Observations on the Reduction of 2,3,5, Triphenyltetrazolium Chloride by Escherichia Coli,
		A Method for Minimizing Effects of Waste Heat Discharges,	5G	W73-04250
Quality of Surface Waters of the United States, 1967: Parts 9-11. Colorado River Basin to Pacific Slope Basins in California.	7C	W73-04481		5B
W73-03924		CHICAGO	5G	CLAY MINERALS
Marina Del Rey: A Study of Environmental Variables in a Semi-Enclosed Coastal Water,	5B	Putting Sewage Solids Back to Work,	5D	The Clay Mineralogy and Some Properties of Bottom Sediments of the St. Lawrence River Near Kingston, Ontario,
W73-04197		W73-04159		W73-04538
		CHITA REGION (USSR)	2J	2K
Raman Spectra-Structure Correlation for Pyrazines. New Method for Obtaining Spectra of Trapped Nanoliter Gas Chromatograph Fractions,	5A	Nature of Soils and Patterns of Their Distribution in the Kyra District, Chita Region, (In Russian),	2G	The Effect of Electrolyte Composition on Hydraulic Conductivity of Certain Texas Soils,
W73-04388		W73-03977		W73-03986
		CHLOR-ALKALI PLANTS	2G	2G
Electronic Spectra of 2-Aminoquinoline and 4-Aminoquinaldine. Evidence for the Cyclic Amidine Structure of the Singly Protonated Cations,	5A	Mercury Pollution,	5B	Behavior of CS-137 and CE-144 in the Sorption System Sea Water-Sediment,
W73-04389		W73-04055		W73-04324
		SU-8	5A	

SUBJECT INDEX

CONDENSATION

Lateral Pressures From Soft Clay, W73-04367	8D	COLOMBIA Forms of Nitrogen in the Volcanic Soils of Sibundoy (In Spanish), W73-04032	5B	COMPRESSIBILITY Penetration of Free-Falling Objects Into Deep- Sea Sediments, W73-04195	2J
CLEANING Sewer Service Gamble Worth \$120,000, W73-04434	5G	COLORADO Ground-Water Levels in the South Platte River Valley of Colorado, 1968-72, W73-04211	7C	COMPUTATION Uplift Computations for Hollow Gravity Dams, W73-04083	8A
CLIMATOLOGY Seasonal Sediment Yield Patterns of U.S. Rivers, W73-04205	2J			COMPUTER-AIDED DESIGN Automatic Designing of Transmission Lines and Substations, W73-04079	8C
The Urban Climate, W73-04355	4C	Experiences with the Sludge Program in the Denver Area, W73-04286	5D	COMPUTER APPLICATIONS Trickle Irrigation System Design, W73-04082	3F
CLIVUS TOILET The Clivus Toilet - Sanitation Without Pollution, W73-04482	5G	COLORADO RIVER Authorizing the Study of a Segment of Colorado for Possible Inclusion in the Wild Rivers System. W73-04464	6E	COMPUTER MODELS A Computer Analysis on the Leaching of Boron From Stratified Soil Columns, W73-03967	2G
CLOGGED PIPELINES Sewer Service Gamble Worth \$120,000, W73-04434	5G	COLORADO RIVER BASIN Quality of Surface Waters of the United States, 1967: Parts 9-11. Colorado River Basin to Pacific Slope Basins in California. W73-03924	7C	Numerical Modeling of the Growth of Ice Crystals, Graupel, and Hail, W73-04104	2C
COAGULATION Researches on Removal of Colloidal Matter From Waste Water Produced in Sanitary Por- celain Ware and Ceramic Industry, W73-03990	5D	Selection of Test Variable for Minimal Time Detection of Basin Response to Natural or Induced Changes, W73-04061	4A	The Ohio State University Version of the Stan- ford Streamflow Simulation Model: Part I - Technical Aspects, W73-04542	2A
Effect of Powdered Activated Carbon on Coagulation with Alum, W73-04165	5D	COLORIMETRY 3-Propyl-5-Hydroxy-5-D-Arabinotetrahydrox- ybutyl-3-Thiazolidine-2-Thione, A Specific Colorimetric Reagent for the Determination of Copper in Water, W73-04056	5A	The Ohio State University Version of the Stan- ford Streamflow Simulation Model: Part II - The Computer Program, W73-04543	2A
COASTAL ENGINEERING Planning for Coastal Ports on a Systems Basis: Preliminary Methodological Design, W73-04525	8A	COLUMBIA RIVER Model Studies of Navigation Improvements, Columbia River Estuary: Report 2, Section 3, Fixed-Bed Studies of Disposal Areas C and D, W73-03915	8B	The Ohio State University Version of the Stan- ford Streamflow Simulation Model: Part III - User's Manual, W73-04544	2A
COASTAL STRUCTURES Planning for Coastal Ports on a Systems Basis: Preliminary Methodological Design, W73-04525	8A	Potential Thermal Effects of an Expanding Power Industry: Columbia River Basin, W73-04024	5C	COMPUTER PROGRAMS Flood Forecasting in the Upper Midwest - Data Assembly and Preliminary Analysis, W73-03906	4A
COASTS Floatable Breakwater Element, W73-04153	8A	A Dynamic Programming Study of Various Diversion Losses, W73-04068	4A	A Computer Analysis on the Leaching of Boron From Stratified Soil Columns, W73-03967	2G
Regional Inventory Report-South Atlantic- Gulf Region, Puerto Rico and the Virgin Islands. W73-04228	8B	Opportunity Costs of a Transbasin Diversion of Water 1. Methodology, W73-04276	4A	Combined use of Optimization and Simulation Models in River Basin Planning, W73-04275	6A
Nonuniform Groundwater-Conduit Discharge and Head Loss, W73-04362	2F	Ecological Studies of Radioactivity in the Columbia River Estuary and Adjacent Pacific Ocean, Progress Report, July 1, 1971-June 30, 1972, W73-04299	5B	CONCENTRATION FACTOR Concentration Factors of Chemical Elements in Edible Aquatic Organisms, W73-04125	5C
Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniyu mor- skikh beregov. 13-21 sentyabrya 1971 g. Palan- ga-Nida. Tezisy dokladov), W73-04514	2J	Techniques for the Characterization of suspended Sediment and Selected Applications for the Acquired Data, W73-04302	5B	CONCENTRATION-TIME MODEL Strontium-90 in the Great Lakes: Concentration- Time Model, W73-04296	5A
COHO SALMON Effects of Acclimation and Acute Temperature Experience on the Swimming Speed of Juvenile Coho Salmon, W73-04243	5C	Thermal Effects Studies on the Lower Colum- bia River, 1968-70, W73-04331	5C	CONCRETE DAMS Behavior of Koyna Dam-Dec. 11, 1967 Earthquake, W73-04076	8E
COLIFORMS Buffalo Lake Recreational Water Quality: A Study in Bacteriological Data Interpretation, W73-04162	5B	COLUMN CHROMATOGRAPHY Rapid Separation of Metal Chelates by Column Liquid-Liquid Chromatography using Ul- traviolet Detection, W73-04391	5A	Planning Concrete Dam Construction Control Surveys, W73-04077	8A
Microbiology of Water, W73-04235	5B	COMMITTEE ON PUBLIC WORKS Savannah River Basin Inspection. W73-04472	6E	Uplift Computations for Hollow Gravity Dams, W73-04083	8A
COLLOIDS Adsorption and Concentration of Dissolved Carbon-14-DDT by Coloring Colloids in Sur- face Waters, W73-04012	5B	CONDENSATION Cooling Tower Plume Rise and Condensation, W73-04025	5D		

SUBJECT INDEX

CONDENSATION

Combined Steam Power Plant and Water Distillation System, W73-04140	3A
CONDENSERS	
Combination Urban-Power Systems Utilizing Waste Heat, W73-04350	5G
CONDUCTIVITY	
Measurement of Unsaturated Conductivity and Diffusivity by Infiltration Through an Impeding Layer, W73-03971	2G
Methods for the Calculation of True Formation Factors in the Bunter Sandstone of Northwest England, W73-04534	2F
CONDUIT DISCHARGE	
Nonuniform Groundwater-Conduit Discharge and Head Loss, W73-04362	2F
CONFERENCE	
The 1971 Tritium Symposium at Las Vegas, W73-04318	5A
CONGRESSIONAL HEARINGS	
Tybee Island, Georgia; Galveston Harbor, Texas, W73-04452	6E
Murrells Inlet, South Carolina; Northport Harbor, Wisconsin. W73-04453	6E
River Basin Monetary Authorizations—1969, Chesapeake Bay Basin in Comprehensive Study. W73-04454	6E
To Authorize Construction, Operation and Maintenance of the North Loup Division, Pick-Sloan Missouri Basin Program, Nebraska. W73-04459	6E
Non-Point Source Pollution From Agricultural, Rural, and Developing Areas. W73-04462	5B
Frio River, Three Rivers, Texas; Mississippi River at Winona, Minnesota; Survey Resolutions. W73-04463	6G
Authorizing the Study of a Segment of Colorado for Possible Inclusion in the Wild Rivers System. W73-04464	6E
Report of the Chief of Engineers to the Secretary of the Army on a Study of Streambank Erosion in the United States. W73-04473	6E
CONNECTICUT	
Gazetteer of Natural Drainage Areas of Streams and Water Bodies within the State of Connecticut, W73-03914	7C
CONSERVATION	
Our Mangroves Threatened, W73-04263	2I
CONSOLIDATION COAL CO.	
Acid Mine Drainage Treatment Process Termed Successful. W73-03999	5D

CONTINENTAL SHELF	
Recent Sediments of the Central California Continental Shelf, Pigeon Point to Sand Hills Bluffs: Part B. Mineralogical Data, W73-03922	2J
CONTROL	
Activation Analysis Trace-Element Studies of Marine Biological Samples, W73-04327	5A
What is Expected in In-Plant Control and Waste Treatment in the Future, W73-04437	5D
CONVECTION	
Finite-Difference Convection Errors, W73-03997	2E
CONVERTERS (ELECTRICAL)	
Radio Interference From HVDC Converter Stations, W73-04084	8C
COOLING	
The Nuclear Plant Controversy - II: Power and Hot Water, W73-04023	5C
Power Plant Cooling Systems, W73-04029	5D
Circulating Water Systems Without Valves, W73-04035	5D
The Thermal-Water Horticultural Demonstration Project at Springfield, Oregon, W73-04343	5G
An Independent View of the Use of Thermal Power Station Cooling Water to Supplement Inter-Regional Water Supply, W73-04346	5G
COOLING SYSTEMS	
Power Plant Cooling Systems, W73-04029	5D
COOLING TOWERS	
Cooling Tower Plume Rise and Condensation, W73-04025	5D
Reclaiming Cooling Tower Blowdown, W73-04040	5D
COOLING WATER	
Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	5D
Cooling Water Treatment-Where Do We Stand, W73-04016	5D
Protective Measures for Cooling Systems in Keeping with Water Quality Standards, W73-04018	5D
Impact of Cooling Water on Lake Temperatures, W73-04037	5B
COOLING WATERS	
Automatic Treatment of Cooling Water, W73-04422	5D
Cooling Water Chlorination and Productivity of Extrained Phytoplankton, W73-04427	5F
COPPER	
3-Propyl-5-Hydroxy-5-D-Arabinotetrahydroxybutyl-3-Thiazolidine-2-Thione, A Specific	5G
Colorimetric Reagent for the Determination of Copper in Water, W73-04056	5A
A High-Selective Titration Method for Determining Copper with 2,2-Bicinchoninic Acid (In Russian), W73-04248	5A
COPPER COMPOUNDS	
Control of Copper Electroplating Wastes: An Annotated Bibliography, W73-04467	5G
CORE DRILLING	
Red Sea Drillings, W73-04193	2J
Analysis of Turbidite Correlation in Cascadia Basin, Northeast Pacific Ocean, W73-04249	5B
CORN-M	
Effect of Nitrogen Source on Corn and Bromegrass Production, Soil pH, and Inorganic Soil Nitrogen, W73-04173	3F
CORRELATION ANALYSIS	
On the Correlation of the Total Precipitable Water in a Vertical Column and Absolute Humidity at the Surface, W73-03923	2B
Using Canonical Correlation for Hydrological Predictions, W73-04381	2E
CORRESPONDENCE MAPPING	
Nebraska Droughts: A Study of their Past Chronological and Spatial Extent with Implications for the Future, W73-03907	2B
CORROSION	
Inhibiting Water Formed Deposits with Threshold Compositions, W73-04166	5D
Pollution Control in Sulphur Mining, W73-04498	5D
CORROSION CONTROL	
Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	5D
Cooling Water Treatment-Where Do We Stand, W73-04016	5D
Protective Measures for Cooling Systems in Keeping with Water Quality Standards, W73-04018	5D
Dry Graphite Film Protects Treatment Plant Units, W73-04444	8G
CORYNEBACTERIUM HYDROCARBOCLASTUS	
Flocculant Production from Kerosene, W73-04245	5B
COST	
A Procedure and Case Study Demonstrations for Evaluating the Cost of Thermal Effluent Control for Proposed Steam-Electric Generating Units, W73-04070	5G

SUBJECT INDEX

DECISION-MAKING

COST-BENEFIT ANALYSIS

A Procedure and Case Study Demonstrations for Evaluating the Cost of Thermal Effluent Control for Proposed Steam-Electric Generating Units, W73-04070

SG

A Procedure for Estimating Costs of Thermal Effluent Modifications for Existing Steam-Electric Generating Stations, W73-04071

SG

COST COMPARISONS

Pond Cleaning Cost Cut 50 Percent by Auger-Equipped Barge, W73-04004

SG

COSTS

A Procedure for Estimating Costs of Thermal Effluent Modifications for Existing Steam-Electric Generating Stations, W73-04071

SG

Learning, External Benefits, and Subsidies in Water Desalination, W73-04274

6B

Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin, W73-04277

6D

COTYLEDONS

Investigations on the Water Uptake of Cracking and Noncracking Cotyledons of Bean Seeds (*Phaseolus vulgaris* L.) (In German), W73-04301

3F

CREEP

Lateral Pressures From Soft Clay, W73-04367

8D

CRIMEA

Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschety maksimal'nykh raskhodov vody dozhdelykh pavodkov na gornykh rekakh Kryma), W73-04115

2E

Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego poloved'ya malykh vodotokov Ukrayini i Moldavii), W73-04116

2E

CROP PRODUCTION

Soil-Water Relationship, W73-03981

3F

CROP ROTATION

Structural Composition and Nutrient Status of Calcareous Chernozem in Crop Rotation, (In Russian), W73-04224

3F

CROP YIELD

Geographical Variations in Yield-Weather Relationships Over A Large Wheat Growing Region, W73-04171

3F

CRUST-TOPPED PROFILES

Transient Infiltration into Crust-Topped Profiles, W73-03976

2G

CRUSTACEANS

Production of Mass Forms of Planktonic Crustaceans in Lake Ilmen (In Russian), W73-04548

2H

CRYOLOGY

Grain-Boundary Energy and Grain-Boundary Groove Angles in Ice, W73-03930

2C

CRYSTALLOGRAPHY

Numerical Modeling of the Growth of Ice Crystals, Graupel, and Hail, W73-04104

2C

CRYSTALLOGRAPHY

Grain-Boundary Energy and Grain-Boundary Groove Angles in Ice, W73-03930

2C

CULTURE MEDIA

Some Observations on the Reduction of 2,3,5, Triphenyltetrazolium Chloride by Escherichia Coli, W73-04250

5B

CULVERTS

Evaluation of Flared Outlet Transitions, W73-04196

8B

CURRENTS (WATER)

A Report on the Prototype Data Collected in the Potomac River for the Chesapeake Bay Model Study, W73-04101

2L

Simple Waves on Shear Flows: Similarity Solutions, W73-04539

2E

The Interaction of Large Amplitude Shallow-Water Waves With an Ambient Shear Flow: Non-Critical Flows, W73-04540

2E

CYCLIC VOLTAMMETRY

Influence of Amalgam Formation on Cyclic Voltammetry, W73-04410

5A

CYCLOPS FUSCUS

Toxic Effects of the Mycotoxins Aflatoxin B1, Rubratoxin B, Patulin, and Diacetoxyscirpenol on the Crustacean Cyclops fuscus, W73-04395

5C

DAILY FLOW

Trickle Irrigation....A More Efficient Means of Water Management, W73-03953

3C

DALTON (GEORGIA)

Pond Cleaning Cost Cut 50 Percent by Auger-Equipped Barge, W73-04004

5G

DAM DESIGN

Uplift Computations for Hollow Gravity Dams, W73-04083

8A

DAMS

Pertinent Data on Spillway Tainter Gates for Corps of Engineers Projects, W73-04377

8C

DARCY'S LAW

Calculation of Discharge from Partially Penetrating Wells in Water Table Aquifers in Isotropic and Anisotropic Soils (Determinacion du debit des puits incomplets de nappes libres forces en terrain isotrope et anisotrope), W73-04382

4B

DATA COLLECTION

Electromagnetic Pulse Sounding for Surveying Underground Water, W73-03912

7B

DATA COLLECTIONS

Hydrographic Observations in Tampa Bay, Florida—1969, W73-03926

5A

Data Record for Public Attitudes Toward Reuse of Reclaimed Water, W73-04059

6B

Fallout Program, Quarterly Summary Report, June 1, 1972 Through Sept. 1, 1972, W73-04315

5B

Spatial Analysis of Rainfall Data from Dense Networks, W73-04383

7C

Calculation of Areal Rainfall Using Finite Element Techniques with Altitudinal Corrections, W73-04385

7C

DATA INTERPRETATION

The Instability of Ocean Populations, W73-04240

5C

DATA LOGGING

Water Treatment Plant for Today and Tomorrow, W73-04435

5D

DATA PROCESSING

Surface Water Movement Studies Utilizing a Tracer Dye Imaging System, W73-03943

7B

Computer-Aided Visual Spectrum Analysis, W73-04234

5A

Using Canonical Correlation for Hydrological Predictions, W73-04381

2E

Spatial Analysis of Rainfall Data from Dense Networks, W73-04383

7C

DATA STORAGE AND RETRIEVAL

Computer-Aided Visual Spectrum Analysis, W73-04234

5A

DAUGAVA RIVER

Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava), W73-04512

2J

DAVENPORT (IOWA)

Sewer Service Gamble Worth \$120,000, W73-04434

5G

DDT

Adsorption and Concentration of Dissolved Carbon-14-DDT by Coloring Colloids in Surface Waters, W73-04012

5B

Effects of Various Soil Fungi and Insecticides on the Capacity of *Mucor alternans* to Degrade DDT, W73-04232

5B

DEAD ZONES

Predicting Effects of Dead Zones on Stream Mixing, W73-04288

5B

DECISION-MAKING

A Study of Water Institutions of Hawaii, W73-04062

6B

SU-11

SUBJECT INDEX

DECISION-MAKING

Learning, External Benefits, and Subsidies in Water Desalination, W73-04274	6B
Environmental Defense Fund, Inc. v. Corps of Engineers of the United States Army (Adequacy of Environmental Impact Statement). W73-04471	6E
DECONTAMINATION	
Radioactive Wastes, W73-04239	5B
Large, Inexpensive Oven used to Decontaminate Glassware for Environmental Pesticide Analysis, W73-04394	5A
DEEP WATER HEAT	
Utilization of Deep Water Heat in Reservoirs for the Maintenance of Unfrozen Water Areas, W73-04034	2C
DEEP WELLS	
Water Inflow into Hole UA-1, Amchitka Island, Alaska, W73-03919	5A
DEFORMATION	
Earth and Earth-Rock Dams, W73-04074	8D
DEHYDRATED POULTRY WASTE	
Dehydrated Poultry Waste in Poultry Rations, W73-03992	5E
DELAWARE	
Water Use Efficiency of Vegetable Crops Grown over Asphalt Moisture Barriers, W73-03902	3F
Sedimentation on Shell Banks in Delaware Bay, W73-04226	2L
DELAWARE BAY	
Sedimentation on Shell Banks in Delaware Bay, W73-04226	2L
DELAWARE RIVER	
Overbank Sedimentation in the Delaware River Valley During the Last 6000 Years, W73-04194	2J
Combined use of Optimization and Simulation Models in River Basin Planning, W73-04275	6A
DELMARVA PENINSULA (VA)	
The Sediments and Sedimentary Processes of the Holocene Tidal Flat Complex, Delmarva Peninsula, Virginia, W73-04360	2L
DELTA	
Use of Fallout Cesium-137 as a Tracer to Define the Recent Deltaic Facies of a River, W73-04501	2J
The Significance of the Rivers of the Volga Delta in the Spawning of Fish (In Russian), W73-04522	2I
DEMAND FUNCTION	
Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin, W73-04277	6D
DEMINERALIZATION	
Waste Water Reuse-A Supplemental Supply, W73-03987	5D

Method and Apparatus for Water Softening, W73-04145	3A
Reverse Osmosis Can Cut Cost of Water Treatment, W73-04549	5D
DEMONSTRATION FARMS	
The Thermal-Water Horticultural Demonstration Project at Springfield, Oregon, W73-04343	5G
DENDROCHRONOLOGY	
Nebraska Droughts: A Study of their Past Chronological and Spatial Extent with Implications for the Future, W73-03907	2B
DENDROCLIMATOLOGY	
Nebraska Droughts: A Study of their Past Chronological and Spatial Extent with Implications for the Future, W73-03907	2B
Characteristics of the Seasonal Growth of Trees in the Light of Dendrochronological and Dendroclimatological Studies (In Russian), W73-04344	2I
DENSITY	
Relation Between Energy and Error Due to Nuclear Statistics for Density Measurement by Gamma Ray Transmission, W73-03964	8D
DENVER	
Experiences with the Sludge Program in the Denver Area, W73-04286	5D
DEODORIZATION	
Fluid Pollution Eradicator System Including an Air Bubble Scrubbing Unit, W73-04137	5D
DEPOLARIZATION	
Measurement of Suspended Solids Concentrations in Sewage by use of a Depolarization Method, W73-04185	5A
DEPOSIT OF POISONOUS WASTE ACT 1972	
Doing Time Takes on a New Meaning for the Wastemakers, W73-04010	5G
DEPOSITION (SEDIMENTS)	
Overbank Sedimentation in the Delaware River Valley During the Last 6000 Years, W73-04194	2J
DEPTH	
A Method for Calculating Water Depth, Attenuation Coefficients and Bottom Reflectance Characteristics, W73-03941	7B
DESALINATION	
Conquest of Wastes Show Productivity. W73-03979	3F
Method and Apparatus for Softening or Desalting Water by Ion Exchange, W73-04133	3A
Learning, External Benefits, and Subsidies in Water Desalination, W73-04274	6B
Australian Sirotherm Process Removes Salt from Brackish Water, W73-04285	5F

DESALINATION APPARATUS	
Conquest of Wastes Show Productivity. W73-03979	3F
Australian Sirotherm Process Removes Salt from Brackish Water, W73-04285	5F
DESALINATION PLANTS	
Australian Sirotherm Process Removes Salt from Brackish Water, W73-04285	5F
DESERT PLANTS	
Radioecology and Ecophysiology of Desert Plants at the Nevada Test Site, W73-04300	SC
DESERTS	
Waste Heat Use in Controlled-Environment Greenhouses, W73-03435	5G
DESIGN	
Reverse Osmosis for Wastewater Treatment, W73-04487	5D
Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India, W73-04496	5D
DESIGN CRITERIA	
Trickle Irrigation System Design, W73-04082	3F
Evaluation of Flared Outlet Transitions, W73-04196	8B
Studies on the Design Data of Gravity Thickening, W73-04433	5D
Kinetic Behavior of Mixed Populations of Activated Sludge, W73-04441	5D
The Case for Higher Rate Waste Water Treatment, W73-04445	5D
DETECTION LIMITS	
Thin Layer Chromatographic Detection of Chlorinated Hydrocarbons as Cross-Contaminants in Pesticide Formulations, W73-04396	5A
DETECTION TECHNIQUES	
Mercury in the Environment - Techniques of Analysis (XIII. Analysetechniken voor Kwik in Het Milieu), W73-04046	5A
DETERGENTS	
Treatment of Sewage, W73-04139	5D
Carbonate and Phosphate Detergent Builders: Their Impact on the Environment, W73-04440	5C
DETROIT RIVER	
Transient Analysis of the Detroit River by the Implicit Method, W73-04207	2E
DEWATERING	
Sludge Dewatering Tests with a Belt Press, W73-04432	5D
DIATOMACEOUS EARTH	
Method of Water Filtration, W73-04132	5D

SUBJECT INDEX

DREDGING

DIATOMS		
The Eutrophication Problem,		
W73-04403	5C	
New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin (Novyye dannyye o diatomovykh vodoroslyakh otdozhennii boreal'noy transgressii v basseyne r. Vagi),		
W73-04517	2J	
DICALCIUM PHOSPHATE		
Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils,		
W73-03974	5B	
Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils,		
W73-03983	2K	
DIESEL ELECTRIC GENERATORS		
Waste Heat Use in Controlled-Environment Greenhouses,		
W73-04345	5G	
DIFFUSION		
A Rapid Method of Measurement of Diffusion Coefficients in Aqueous Solutions,		
W73-03966	2K	
Absorption of Water by a Soil from a Circular Cylindrical Source,		
W73-04200	5B	
Relative Diffusion in Nonisotropic Turbulence,		
W73-04212	5B	
DIFFUSION MEASUREMENT		
A Rapid Method of Measurement of Diffusion Coefficients in Aqueous Solutions,		
W73-03966	2K	
DIFFUSIVITY		
Measurement of Unsaturated Conductivity and Diffusivity by Infiltration Through an Impeding Layer,		
W73-03971	2G	
Wave Effect and Eddy Diffusivity in the Air near a Water Surface,		
W73-04209	2E	
DIGITAL COMPUTERS		
Miniature On-Line Digital Computer for Multipurpose Applications. Applications to Kinetic Analyses,		
W73-04387	7C	
DIRECT INJECTION ENTHALPIOMETRY		
Perchlorate Determination by Thermometric Enthalpy Titration,		
W73-04230	5A	
DISCHARGE MEASUREMENT		
Estimating Discharge from Superelevation in Bends,		
W73-04219	8B	
DISCHARGE (WATER)		
Investigation and Calculation of Components in the Hydrologic Regime of Rivers (Issledovaniya i raschety elementov gidrologicheskogo rezhima rek).		
W73-04111	2E	
Effect of Karst on Floods on Left-Bank Tributaries of the Dniester River (Vliyanie karsta na formirovaniye livneykh pavodkov na levobereznykh pritokakh Dnestr'a),		
W73-04114	2E	
DISTILLATION		
Combined Steam Power Plant and Water Distillation System,		
W73-04140	3A	
DISTRIBUTION		
Behavior of CS-137 and CE-144 in the Sorption System Sea Water-Sediment,		
W73-04324	5A	
DISTRIBUTION PATTERNS		
Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico,		
W73-04241	5C	
Some Single- and Multi-Site Models of Rainfall Within Discrete Time Increments,		
W73-04372	2B	
Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschety maksimal'nykh raskhodov vody dozhddevykh pavodkov na gornykh rekakh Kryma),		
W73-04115	2E	
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego poloved'ya malykh vodotokov Ukrayiny i Moldavii),		
W73-04116	2E	
Minimum Streamflow in Northwest Ukraine (Osobennosti formirovaniya minimal'nogo stoka rek Severo-Zapada Ukrayiny),		
W73-04118	2E	
DISINFECTION		
Wastewater Treatment Sequence,		
W73-04146	5D	
DISPERSION		
Finite-Difference Convection Errors,		
W73-03997	2E	
Line Source Distributions in Two Dimensions: Applications to Water Quality,		
W73-04201	5B	
Relative Diffusion in Nonisotropic Turbulence,		
W73-04212	5B	
Longitudinal Dispersion in Sinuous Channels,		
W73-04214	5B	
Dispersion From Pit in Uniform Seepage,		
W73-04222	5B	
Predicting Effects of Dead Zones on Stream Mixing,		
W73-04288	5B	
Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report,		
W73-04290	5B	
DISPERSION EQUATION		
Cooling Tower Plume Rise and Condensation,		
W73-04025	5D	
DISPERSION ERROR CALCULATION		
Finite-Difference Convection Errors,		
W73-03997	2E	
DISSOLUTION		
Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils,		
W73-03974	5B	
Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils,		
W73-03983	2K	
DISTILLATION		
Combined Steam Power Plant and Water Distillation System,		
W73-04140	3A	
DISTRIBUTION		
Behavior of CS-137 and CE-144 in the Sorption System Sea Water-Sediment,		
W73-04324	5A	
DISTRIBUTION PATTERNS		
Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico,		
W73-04241	5C	
Some Single- and Multi-Site Models of Rainfall Within Discrete Time Increments,		
W73-04372	2B	
Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschety maksimal'nykh raskhodov vody dozhddevykh pavodkov na gornykh rekakh Kryma),		
W73-04115	2E	
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego poloved'ya malykh vodotokov Ukrayiny i Moldavii),		
W73-04116	2E	
Minimum Streamflow in Northwest Ukraine (Osobennosti formirovaniya minimal'nogo stoka rek Severo-Zapada Ukrayiny),		
W73-04118	2E	
DISINFECTION		
Wastewater Treatment Sequence,		
W73-04146	5D	
DISPERSION		
Finite-Difference Convection Errors,		
W73-03997	2E	
Line Source Distributions in Two Dimensions: Applications to Water Quality,		
W73-04201	5B	
Relative Diffusion in Nonisotropic Turbulence,		
W73-04212	5B	
Longitudinal Dispersion in Sinuous Channels,		
W73-04214	5B	
Dispersion From Pit in Uniform Seepage,		
W73-04222	5B	
Predicting Effects of Dead Zones on Stream Mixing,		
W73-04288	5B	
Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report,		
W73-04290	5B	
DISPERSION EQUATION		
Cooling Tower Plume Rise and Condensation,		
W73-04025	5D	
DISPERSION ERROR CALCULATION		
Finite-Difference Convection Errors,		
W73-03997	2E	
DISSOLUTION		
Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils,		
W73-03974	5B	
Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils,		
W73-03983	2K	
DISTILLATION		
Combined Steam Power Plant and Water Distillation System,		
W73-04140	3A	
DISTRIBUTION		
Behavior of CS-137 and CE-144 in the Sorption System Sea Water-Sediment,		
W73-04324	5A	
DISTRIBUTION PATTERNS		
Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico,		
W73-04241	5C	
Some Single- and Multi-Site Models of Rainfall Within Discrete Time Increments,		
W73-04372	2B	
Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschety maksimal'nykh raskhodov vody dozhddevykh pavodkov na gornykh rekakh Kryma),		
W73-04115	2E	
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego poloved'ya malykh vodotokov Ukrayiny i Moldavii),		
W73-04116	2E	
Minimum Streamflow in Northwest Ukraine (Osobennosti formirovaniya minimal'nogo stoka rek Severo-Zapada Ukrayiny),		
W73-04118	2E	
DISINFECTION		
Wastewater Treatment Sequence,		
W73-04146	5D	
DISPERSION		
Finite-Difference Convection Errors,		
W73-03997	2E	
Line Source Distributions in Two Dimensions: Applications to Water Quality,		
W73-04201	5B	
Relative Diffusion in Nonisotropic Turbulence,		
W73-04212	5B	
Longitudinal Dispersion in Sinuous Channels,		
W73-04214	5B	
Dispersion From Pit in Uniform Seepage,		
W73-04222	5B	
Predicting Effects of Dead Zones on Stream Mixing,		
W73-04288	5B	
Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report,		
W73-04290	5B	
DISPERSION EQUATION		
Cooling Tower Plume Rise and Condensation,		
W73-04025	5D	
DISPERSION ERROR CALCULATION		
Finite-Difference Convection Errors,		
W73-03997	2E	
DISSOLUTION		
Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils,		
W73-03974	5B	
Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils,		
W73-03983	2K	
DISTILLATION		
Combined Steam Power Plant and Water Distillation System,		
W73-04140	3A	
DISTRIBUTION		
Behavior of CS-137 and CE-144 in the Sorption System Sea Water-Sediment,		
W73-04324	5A	
DISTRIBUTION PATTERNS		
Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico,		
W73-04241	5C	
Some Single- and Multi-Site Models of Rainfall Within Discrete Time Increments,		
W73-04372	2B	
Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschety maksimal'nykh raskhodov vody dozhddevykh pavodkov na gornykh rekakh Kryma),		
W73-04115	2E	
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego poloved'ya malykh vodotokov Ukrayiny i Moldavii),		
W73-04116	2E	
Minimum Streamflow in Northwest Ukraine (Osobennosti formirovaniya minimal'nogo stoka rek Severo-Zapada Ukrayiny),		
W73-04118	2E	
DISINFECTION		
Wastewater Treatment Sequence,		
W73-04146	5D	
DISPERSION		
Finite-Difference Convection Errors,		
W73-03997	2E	
Line Source Distributions in Two Dimensions: Applications to Water Quality,		
W73-04201	5B	
Relative Diffusion in Nonisotropic Turbulence,		
W73-04212	5B	
Longitudinal Dispersion in Sinuous Channels,		
W73-04214	5B	
Dispersion From Pit in Uniform Seepage,		
W73-04222	5B	
Predicting Effects of Dead Zones on Stream Mixing,		
W73-04288	5B	
Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report,		
W73-04290	5B	
DISPERSION EQUATION		
Cooling Tower Plume Rise and Condensation,		
W73-04025	5D	
DISPERSION ERROR CALCULATION		
Finite-Difference Convection Errors,		
W73-03997	2E	
DISSOLUTION		
Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils,		
W73-03974	5B	
Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils,		
W73-03983	2K	
DISTILLATION		
Combined Steam Power Plant and Water Distillation System,		
W73-04140	3A	
DISTRIBUTION		
Behavior of CS-137 and CE-144 in the Sorption System Sea Water-Sediment,		
W73-04324	5A	
DISTRIBUTION PATTERNS		
Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico,		
W73-04241	5C	
Some Single- and Multi-Site Models of Rainfall Within Discrete Time Increments,		
W73-04372	2B	
Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschety maksimal'nykh raskhodov vody dozhddevykh pavodkov na gornykh rekakh Kryma),		
W73-04115	2E	
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego poloved'ya malykh vodotokov Ukrayiny i Moldavii),		
W73-04116	2E	
Minimum Streamflow in Northwest Ukraine (Osobennosti formirovaniya minimal'nogo stoka rek Severo-Zapada Ukrayiny),		
W73-04118	2E	
DISINFECTION		
Wastewater Treatment Sequence,		
W73-04146	5D	
DISPERSION		
Finite-Difference Convection Errors,		
W73-03997	2E	
Line Source Distributions in Two Dimensions: Applications to Water Quality,		
W73-04201	5B	
Relative Diffusion in Nonisotropic Turbulence,		
W73-04212	5B	
Longitudinal Dispersion in Sinuous Channels,		
W73-04214	5B	
Dispersion From Pit in Uniform Seepage,		
W73-04222	5B	
Predicting Effects of Dead Zones on Stream Mixing,		
W73-04288	5B	
Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report,		
W73-04290	5B	
DISPERSION EQUATION		
Cooling Tower Plume Rise and Condensation,		
W73-04025	5D	
DISPERSION ERROR CALCULATION		
Finite-Difference Convection Errors,		
W73-03997	2E	
DISSOLUTION		
Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils,		
W73-03974	5B	
Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils,		
W73-03983	2K	
DISTILLATION		
Combined Steam Power Plant and Water Distillation System,		
W73-04140	3A	
DISTRIBUTION		
Behavior of CS-137 and CE-144 in the Sorption System Sea Water-Sediment,		
W73-04324	5A	
DISTRIBUTION PATTERNS		
Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico,		
W73-04241	5C	
Some Single- and Multi-Site Models of Rainfall Within Discrete Time Increments,		
W73-04372	2B	
Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschety maksimal'nykh raskhodov vody dozhddevykh pavodkov na gornykh rekakh Kryma),		
W73-04115	2E	
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego poloved'ya malykh vodotokov Ukrayiny i Moldavii),		
W73-04116	2E	
Minimum Streamflow in Northwest Ukraine (Osobennosti formirovaniya minimal'nogo stoka rek Severo-Zapada Ukrayiny),		
W73-04118	2E	
DISINFECTION		
Wastewater Treatment Sequence,		
W73-04146	5D	
DISPERSION		
Finite-Difference Convection Errors,		
W73-03997	2E	
Line Source Distributions in Two Dimensions: Applications to Water Quality,		
W73-04201	5B	
Relative Diffusion in Nonisotropic Turbulence,		
W73-04212	5B	
Longitudinal Dispersion in Sinuous Channels,		
W73-04214	5B	
Dispersion From Pit in Uniform Seepage,		
W73-04222	5B	
Predicting Effects of Dead Zones on Stream Mixing,		
W73-04288	5B	
Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report,		
W73-04290	5B	
DISPERSION EQUATION		
Cooling Tower Plume Rise and Condensation,		
W73-04025	5D	
DISPERSION ERROR CALCULATION		
Finite-Difference Convection Errors,		
W73-03997	2E	
DISSOLUTION		
Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils,		
W73-03974	5B	
Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils,		
W73-03983	2K	
DISTILLATION		
Combined Steam Power Plant and Water Distillation System,		
W73-04140	3A	
DISTRIBUTION		
Behavior of CS-137 and CE-144 in the Sorption System Sea Water-Sediment,		
W73-04324	5A	
DISTRIBUTION PATTERNS		
Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico,		
W73-04241	5C	
Some Single- and Multi-Site Models of Rainfall Within Discrete Time Increments,		
W73-04372	2B	
Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschety maksimal'nykh raskhodov vody dozhddevykh pavodkov na gornykh rekakh Kryma),		
W73-04115	2E	
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego poloved'ya malykh vodotokov Ukrayiny i Moldavii),		
W73-04116	2E	
Minimum Streamflow in Northwest Ukraine (Osobennosti formirovaniya minimal'nogo stoka rek Severo-Zapada Ukrayiny),		
W73-04118	2E	
DISINFECTION		
Wastewater Treatment Sequence,		
W73-04146	5D	
DISPERSION		
Finite-Difference Convection Errors,		
W73-03997	2E	
Line Source Distributions in Two Dimensions: Applications to Water Quality,		
W73-04201	5B	
Relative Diffusion in Nonisotropic Turbulence,		
W73-04212	5B	
Longitudinal Dispersion in Sinuous Channels,		
W73-04214	5B	
Dispersion From Pit in Uniform Seepage,		
W73-04222	5B	
Predicting Effects of Dead Zones on Stream Mixing,		
W73-04288	5B	
Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report,		
W73-04290	5B	
DISPERSION EQUATION		
Cooling Tower Plume Rise and Condensation,		
W73-04025	5D	
DISPERSION ERROR CALCULATION		
Finite-Difference Convection Errors,		
W73-03997</		

SUBJECT INDEX

DRIP IRRIGATION

DRIP IRRIGATION
 Trickle Irrigation....A More Efficient Means of Water Management,
 W73-03953 3C

DROUGHT
 Photosynthetic Response to Drought in Maize,
 W73-04260 3F

DROUGHTS
 Nebraska Droughts: A Study of their Past Chronological and Spatial Extent with Implications for the Future,
 W73-03907 2B

Some Generalized Characteristics of the Floods and Droughts of the Lower Mekong,
 W73-04380 2E

DRY CAUSTIC PEELING
 Minimizes Fruit Peel Pollution,
 W73-04284 5D

DYE RELEASES
 Surface Water Movement Studies Utilizing a Tracer Dye Imaging System,
 W73-03943 7B

DYES
 Extraction of Anions into Chloroform by Surfactant Cations. Relevance to Dye Extraction Method of Analysis of Long Chain Amines,
 W73-04408 5A

DYNAMIC PROGRAMMING
 Opportunity Costs of a Transbasin Diversion of Water 1. Methodology,
 W73-04276 4A

E. COLI
 A Comparative Study of the Inactivation of Viruses in Water by Chlorine,
 W73-03991 5F

Some Observations on the Reduction of 2,3,5, Triphenyltetrazolium Chloride by Escherichia Coli,
 W73-04250 5B

EARTH DAMS
 Movements in Dams Due to Reservoir Filling,
 W73-04073 8D

Earth and Earth-Rock Dams,
 W73-04074 8D

EARTH PRESSURE
 Lateral Pressures From Soft Clay,
 W73-04367 8D

EARTHQUAKE ENGINEERING
 Behavior of Koyna Dam-Dec. 11, 1967
 Earthquake,
 W73-04076 8E

EARTHQUAKES
 Behavior of Koyna Dam-Dec. 11, 1967
 Earthquake,
 W73-04076 8E

EASLEY (SO.CAR)
 Award Winning Water Treatment Plant Features Automation,
 W73-04447 5D

ECKENFELDER FORMULA
 Performance of Deep Trickling Filters by Five Methods,
 W73-04486 5D

ECOLOGICAL STUDIES

Mathematical Model of the Ecological System of Lake Drivyat, (in Russian),
 W73-04321 5C

ECOLOGY
 Limnology and Fish Ecology of Sockeye Salmon Nursery Lakes of the World,
 W73-04405 5C

ECONOMIC PREDICTION

A Procedure and Case Study Demonstrations for Evaluating the Cost of Thermal Effluent Control for Proposed Steam-Electric Generating Units,
 W73-04070 5G

ECONOMIC PREDICTIONS

A Procedure for Estimating Costs of Thermal Effluent Modifications for Existing Steam-Electric Generating Stations,
 W73-04071 5G

ECONOMICS

Siting A Thermal Multi-Purpose Energy Center,
 W73-04021 5C

A Procedure and Case Study Demonstrations for Evaluating the Cost of Thermal Effluent Control for Proposed Steam-Electric Generating Units,
 W73-04070 5G

Beneficial Use of Heat in Iceland, Technical and Economical Aspects and Future Prospects,
 W73-04348 5G

ECOSYSTEMS
 Studies on Chemical, Physical an Biological Conditions in Swedish Rockpool Ecosystems,
 W73-04191 2H

EDGE EFFECT
 Soil Air Pressure and Water Infiltration Under Border Irrigation,
 W73-04087 2G

EDIBLE AQUATIC ORGANISMS
 Concentration Factors of Chemical Elements in Edible Aquatic Organisms,
 W73-04125 5C

EDTA
 Titrimetric Microdetermination of Zinc With EDTA Using 1,5-Di-Beta-Naphthylthiocarbazone (HNDZ) as an Extractive Indicator,
 W73-04231 5A

EFFLUENT DISPOSAL
 Wastewater Reclamation by Irrigation,
 W73-04480 5D

EFFLUENT SLURRY
 The BIO-Gas Plant: Generating Methane from Organic Wastes,
 W73-04157 5G

EFFLUENT STANDARDS
 Effluent Standards as Proposed by the Royal Commission on Sewage Disposal,
 W73-04491 5G

Effluent Standards and the Assessment of the Effects of Pollution on Rivers,
 W73-04494 5G

EFFLUENT STREAMS
 Effluent Standards and the Assessment of the Effects of Pollution on Rivers,
 W73-04494 5G

EFFLUENTS

Reclamation and Industrial Reuse of Amarillo's Waste Water,
 W73-03988 5D

Large Power Plant Effluent Study (Lappes) Volume 3 - Instrumentation, Procedures, and Data Tabulations (1970),
 W73-04121 5A

Reduces Effluent from Blanching,
 W73-04163 5D

The Dose to Man from Atmospheric KR-85,
 W73-04291 5B

Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant,
 W73-04311 5A

Radiological Surveillance at Pressurized Water Reactors,
 W73-04325 5B

Effluent Standards and Water Reuse,
 W73-04425 5D

ELECTRIC COOLING

A Matter of Design,
 W73-04030 6C

ELECTRIC CORONAS

An Analysis of Transmission Line Audible Noise Levels Based Upon Field and Three-Phase Test Line Measurements,
 W73-04085 8C

ELECTRIC HEATING

A Matter of Design,
 W73-04030 6C

ELECTRIC NETWORKS

Pumped Storage and Tidal Power in Energy Systems,
 W73-04033 5G

ELECTRIC POWER COSTS

Clean Water and Power,
 W73-04436 5G

ELECTRIC POWER DEMAND

Clean Water and Power,
 W73-04436 5G

ELECTRIC POWER INDUSTRY

Potential Thermal Effects of an Expanding Power Industry: Columbia River Basin,
 W73-04024 5C

ELECTRIC POWER PRODUCTION

Logical Approaches to Power Supply and Environment,
 W73-04036 5G

Tidal Energy From the Bay of Fundy,
 W73-04041 8A

Trends of Power Generation and Thermal Discharges in New York State,
 W73-04338 5G

Indexed Bibliography of Thermal Effects Literature -2,
 W73-04353 5C

ELECTRICAL CONDUCTANCE

Calculation of Electrical Conductivity From Solution Composition Data as an Aid to In-Situ Estimation of Soil Salinity,
 W73-03984 2G

SUBJECT INDEX

			ENVIRONMENTAL IMPACT STATEMENTS
ELECTRICAL DESIGN			Pesticide Regulations and Residue Problems in Japan, W73-04042
Automatic Designing of Transmission Lines and Substations, W73-04079	8C		5B
ELECTRICAL RESISTANCE			Environmental Aspects of High Voltage Substations, W73-04080
Electrical Earth Resistivity Surveying in Landfill Investigations, W73-03918	5B		8C
ELECTRICAL STUDIES			Thermal Effects Studies on the Lower Columbia River, 1968-70, W73-04331
Influence of Water Content on Electrical Conductivity of the Soil, W73-04093	2G		5C
Methods for the Calculation of True Formation Factors in the Bunter Sandstone of Northwest England, W73-04534	2F		Factors of Ecologic Succession in Oligotrophic Fish Communities of the Laurentian Great Lakes, W73-04399
ELECTRICAL WELL LOGGING			Loch Lomond: Man's Effects on the Salmonid Community, W73-04407
Methods for the Calculation of True Formation Factors in the Bunter Sandstone of Northwest England, W73-04534	2F		5C
ELECTRICITY			Tybee Island, Georgia; Galveston Harbor, Texas, W73-04452
A Matter of Design, W73-04030	6C		6E
ELECTROCHEMISTRY			Plaquemine Lock Closure, Mississippi River and Tributaries Project, Iberville Parish, Louisiana, Associated Water Features, Bayou Plaquemine and Gulf Intracoastal Waterway (Final Environmental Impact Statement). W73-04457
Influence of Amalgam Formation on Cyclic Voltammetry, W73-04410	5A		8D
ELECTRODES			East Fork of Whitewater River, Indiana and Ohio (Final Environmental Impact Statement). W73-04458
Influence of Amalgam Formation on Cyclic Voltammetry, W73-04410	5A		8A
Fluoroide Ion Activity Electrode as a Suitable Means for Exact Direct Determination of Urinary Fluoride, W73-04415	5A		Frio River, Three Rivers, Texas; Mississippi River at Winona, Minnesota; Survey Resolutions. W73-04463
ELECTROLYSIS			Eden Preserved, W73-04466
Reduction of Aromatic Fluorine Compounds, W73-04412	5B		5G
ELECTROLYTIC TECHNIQUES			Construction of Wastewater Facilities, Red Oak, Texas (Final Environmental Impact Statement). W73-04468
Electrochemical Oxygen Demand System, W73-04147	5A		5G
ELECTROMAGNETIC WAVES			Former Camp Parks Sewage Disposal Plant, Parcel A-2 Pleasanton, California (Final Environmental Impact Statement). W73-04474
Electromagnetic Pulse Sounding for Surveying Underground Water, W73-03912	7B		5G
ELECTRONIC DETECTORS			Genesee River Basin, New York and Pennsylvania (Final Environmental Impact Statement). W73-04475
An Electronic Detector System for Recovering Internally Tagged Menhaden, Genus Brevoortia, W73-04174	7B		8A
ELECTRONIC EQUIPMENT			ENVIRONMENTAL IMPACT STATEMENTS
New, Directly Digital Automatic Titration Apparatus, W73-04252	7B		Murrells Inlet, South Carolina: Northport Harbor, Wisconsin. W73-04453
ELECTRONIC SPECTRA			Plaquemine Lock Closure, Mississippi River and Tributaries Project, Iberville Parish, Louisiana, Associated Water Features, Bayou Plaquemine and Gulf Intracoastal Waterway (Final Environmental Impact Statement). W73-04457
Electronic Spectra of 2-Aminoquinoline and 4-Aminoquinoline. Evidence for the Cyclic Amidine Structure of the Singly Protonated Cations, W73-04389	5A		8D
ELEMENTS (CHEMICAL)			East Fork of Whitewater River, Indiana and Ohio (Final Environmental Impact Statement). W73-04458
Concentration Factors of Chemical Elements in Edible Aquatic Organisms, W73-04125	5C		8A
ENVIRONMENTAL CONTROL			Construction of Wastewater Facilities, Red Oak, Texas (Final Environmental Impact Statement). W73-04468
Doing Time Takes on a New Meaning for the Wastemakers, W73-04010	5G		5G
ENVIRONMENTAL EFFECTS			Environmental Defense Fund, Inc. V. Corps of Engineers of the United States Army (Adequacy of Environmental Impact Statement). W73-04471
Doing Time Takes on a New Meaning for the Wastemakers, W73-04010	5G		6E
Logical Approaches to Power Supply and Environment, W73-04036	5G		6E

ENVIRONMENTAL IMPACT STATEMENTS

SUBJECT INDEX

Former Camp Parks Sewage Disposal Plant, Parcel A-2 Pleasanton, California (Final Environmental Impact Statement).	ESTONIAN SSR	Interception of Rain by Forest Vegetation-Estimation of Daily Interception Using a Mathematical Model (Interception de la pluie par la vegetation forestiere—estimation de l'interception journaliere a l'aide d'un modele mathematique),
W73-04474	Marginal Glaciation in Northern Estonia (Krayevye lednikovyye obrazovaniya Severnoy Estonii),	W73-04513
Genesee River Basin, New York and Pennsylvania (Final Environmental Impact Statement).	2C	W73-04530
W73-04475	2A	
EQUATIONS	ESTUARIES	EVAPOTRANSPIRATION
Streamflow Routing (With Applications to North Carolina Rivers), W73-03908	Model Studies of Navigation Improvements, Columbia River Estuary: Report 2, Section 3, Fixed-Bed Studies of Disposal Areas C and D, W73-03915	Evapotranspiration and Potential Evapotranspiration Measures in Santiago de Compostela (Spain),
4A	A Reconnaissance of the Winyah Bay Estuarine Zone, South Carolina, W73-04095	W73-04028
Predicting Soil Moisture in the Southern Appalachians, W73-04086	7C	2D
2G	A Report on the Prototype Data Collected in the Potomac River for the Chesapeake Bay Model Study, W73-04101	Comparison of Recharge to Groundwater Under Pasture and Forest Using Environmental Tritium, W73-04373
Dynamic of the Soil-Water System During a Rainstorm, W73-04107	2L	2F
2G	Marine and Estuarine Pollution, W73-04237	Water Table Fluctuations Under Forest and Pasture in a Karstic Region of Southern Australia, W73-04374
Seepage From Shallow Reservoir, W73-04221	5A	2F
4A	A Method for Minimizing Effects of Waste Heat Discharges, W73-04481	
The Lateral Inflow into Submerged Drains, W73-04384	5G	
8B	EXCHANGE RESINS	
EROSION	ESTUARINE ENVIRONMENT	Ion Exchange for the Metal Products Finisher-Part I, W73-04497
Particle Size of Mudflows on Carpathian Rivers in the Ukraine (Granulometricheskiy sostav selevykh otlozhcheniy na rekakh Ukrainskikh Karpat), W73-04119	Seasonal Concentration, Turnover, and Mode of Accumulation of p32 by the Juvenile Starry Flounder in the Columbia River Estuary, Platichthys Stellatus (Pallas), W73-04322	5D
2E	5C	
A Study of Erosion Resistance of Soils on the Northern Slopes of Trans-Ili Ala-Tau and the Ketmen Range (In Russian), W73-04179	ETHIOPIA	EXPANSIVE CLAYS
2J	Some Coordination Effects in Natural Waters of Ethiopia, W73-04529	Water Movement in Undisturbed Swelling Clay Soil, W73-04089
Some Features of the Mountain Steppe Soils of Trans-Ili and Dzungarian Ala-Tau in Connection with Erosion (In Russian), W73-04281	2K	2G
2G	EUCALYPTS-D	
Erosion Sediment Production, W73-04358	Determination of Water Stress of Eucalypts in the Field, W73-04485	
2J	2I	
Report of the Chief of Engineers to the Secretary of the Army on a Study of Streambank Erosion in the United States, W73-04473	EUTROPHICATION	EXTERNAL BENEFITS
6E	The Eutrophication Problem, W73-04403	Learning, External Benefits, and Subsidies in Water Desalination, W73-04274
EROSION CONTROL	EVALUATION	6B
Water Permeability of Frozen Soil in Connection with Antierosion Conservation Tillage of Fall-Plowed Soil on Slopes, (In Ukrainian), W73-03916	Evaluation of Herbicides for Possible Mutagenic Properties, W73-04233	
2G	5C	
Techniques for the Characterization of suspended Sediment and Selected Applications for the Acquired Data, W73-04302	Radiocarbon in the Sea, W73-04292	
5B	5B	
Urban Erosion--Practical Alternatives, W73-04359	EVAPORATION	
4D	Effects of Soil Texture on Evaporative Loss and Available Water in Semi-Arid Climates, W73-03952	
Report of the Chief of Engineers to the Secretary of the Army on a Study of Streambank Erosion in the United States, W73-04473	Investigation of the Possibility of Artificial Control of the Rate of Evaporation from Soils (In Russian), W73-04013	
6E	2D	
ESKERS	Steady-State Evaporation Through Non-Homogeneous Soils From a Shallow Water Table, W73-04110	
Movement of Water in Glaciers, W73-03936	2D	
2C	Wave Effect and Eddy Diffusivity in the Air near a Water Surface, W73-04209	
ESTIMATING	2E	
Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin, W73-04277	Isothermal Drying of Structurally Layered Soil Columns, W73-04256	
6D	2D	

SUBJECT INDEX

FLOOD DISCHARGE

FATTY ACIDS			
Analysis for Crude Fatty Acids (Total Fatty Acids and Unsaponifiable Matter) in Feed Grade Fats: Report of the Joint AOAC-AOCS Committee on the Analysis of Feed Grade Fats, W73-04397	5A		
FEASIBILITY			
Opportunity Costs of a Transbasin Diversion of Water I. Methodology, W73-04276	4A		
FEASIBILITY STUDIES			
Characterization of the Sediments from the Tuira and Sabana River Estuaries, W73-04308	5C		
FEDERAL GOVERNMENT			
The 92nd Congress—Good and Bad. W73-04456	6E		
FEDERAL JURISDICTION			
The Expansion of Federal Common Law and Federal Question Jurisdiction to Interstate Pollution, W73-04461	5G		
FEEDS			
Dehydrated Poultry Waste in Poultry Rations, W73-03992	5E		
FERMENTATION			
Flocculant Production from Kerosene, W73-04245	5B		
FERTILIZATION			
Effect of Irrigation, Fertilization and Plowing Depth on Quantity of White Wheat and Maize, W73-04267	3F		
FILTERS			
Sewage Treatment System, W73-04141	5D		
Backflushing Filter, W73-04151	5D		
Thermal Conditioning Tests of Activated Sludge and Anaerobic Digestion Test of the Filtrates, W73-04476	5D		
FILTRATION			
Sewage Treatment Plant and Method of Treating Sewage, W73-04130	5D		
Method of Water Filtration, W73-04132	5D		
Sewage Treatment System, W73-04141	5D		
Wastewater Treatment Sequence, W73-04146	5D		
Backflushing Filter, W73-04151	5D		
Andover Sewage-Treatment Works, W73-04439	5D		
Direct Filtration an Economic Answer to Water Treatment Needs, W73-04446	5D		
Award Winning Water Treatment Plant Features Automation, W73-04447	5D		
FINITE ELEMENT ANALYSIS			
Finite-Element Stress Analysis of Avalanche Snowpacks, W73-03928	2C		
Earth and Earth-Rock Dams, W73-04074	8D		
Calculation of Areal Rainfall Using Finite Element Techniques with Altitudinal Corrections, W73-04385	7C		
FISH			
Mercury in Fish - Total Content in Freshwater and Marine Fishes (VII. (Totaal) Kwikgehalte van Zeevissen), W73-04044	5C		
Mercury in Fish - Imported Tinned Fish, (IX. Kwikgehalten van een Aantal Sorten Ingeblikte Vis), W73-04045	5C		
Birds Give Warning, W73-04049	5C		
Mercury Concentration in Recent and Ninety-Year-Old Benthopelagic Fish, W73-04122	5B		
Methylmercury, A Review of Health Hazards and Side Effects Associated with the Emission of Mercury into Natural Systems, W73-04127	5C		
Radionuclides in Lake Michigan Fish, W73-04306	5A		
Thermal Effects Studies on the Lower Columbia River, 1968-70, W73-04331	5C		
The Eutrophication Problem, W73-04403	5C		
FISH BEHAVIOR			
Effects of Acclimation and Acute Temperature Experience on the Swimming Speed of Juvenile Coho Salmon, W73-04243	5C		
FISH FARMING			
Conference on Beneficial Uses of Thermal Discharges, W73-04337	5G		
Development of Systems in Marine Fish Cultivation in the United Kingdom, W73-04339	5G		
Catfish Farming - Beneficial Use of Waste Heat, W73-04341	5G		
FISH FOOD			
Accessibility of Amino Acids in Artificial Food To Pond Fish: III. Accessibility of Amino Acids in Soybean Meal, Castor Oil Cakes, Wheat and Food Mixes to Yearling Carp (In Russian), W73-04309	8I		
Consumption of Oligochaete Worms by Fish and Invertebrates, (In Russian), W73-04520	2I		
FISH HATCHERIES			
Development of Systems in Marine Fish Cultivation in the United Kingdom, W73-04339	5G		
FISH MIGRATION			
N Sub 2-Threat to Pacific Northwest Fisheries, W73-04075	8I		
FISH SPAWNING			
The Significance of the Rivers of the Volga Delta in the Spawning of Fish (In Russian), W73-04522	2I		
FISH STOCKING			
Effects of Introductions of Salmonids into Barren Lakes, W73-04406	5C		
FISHERIES			
N Sub 2-Threat to Pacific Northwest Fisheries, W73-04075	8I		
FISHING			
Marculture in Japan Using Heated Effluent Water, W73-04340	5G		
FLARED OUTLET TRANSITIONS			
Evaluation of Flared Outlet Transitions, W73-04196	8B		
FLOCCULANTS			
Flocculant Production from Kerosene, W73-04245	5B		
FLOCCULATION			
An Evaluation of Procedures for Enumerating Bacteria in Activated Sludge, W73-04450	5A		
The Optimum Flocculant Concentration for Effective Flocculation of China Clay in Aqueous Suspension, W73-04477	5D		
FLOOD CONTROL			
Frio River, Three Rivers, Texas; Mississippi River at Winona, Minnesota; Survey Resolutions, W73-04463	6G		
Genesee River Basin, New York and Pennsylvania (Final Environmental Impact Statement). W73-04475	8A		
FLOOD DATA			
Historic Flood on the Tisza River, May 12-18, 1970 (Vydayushchiysya dozhdevoy pavodok na r. Tie 12-18 maya 1970 g.), W73-04112	2E		
Flood of September 20-23, 1969, in the Gadsden County Area, Florida, W73-04535	2E		
FLOOD DISCHARGE			
Effect of Karst on Floods on Left-Bank Tributaries of the Dniester River (Vlyaniye karsta na formirovaniye livnevyykh pavodkov na levoberezhnykh pritokakh Dnestr), W73-04114	2E		
Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschety maksimal'nykh raskhodov vody dozhdevykh pavodkov na gornykh rekakh Kryma), W73-04115	2E		
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego poloved'ya malykh vodotokov Ukrayiny i Moldavii), W73-04116	2E		

SUBJECT INDEX

FLOOD FORECASTING

FLOOD FORECASTING

Flood Forecasting in the Upper Midwest - Data Assembly and Preliminary Analysis, W73-03906

4A

Rainfall and Runoff in Urban Areas-A Case Study of Flooding in the Piedmont of North Carolina, W73-04356

4C

Using Canonical Correlation for Hydrological Predictions, W73-04381

2E

An Index of Flood-Producing Rainfall Based on Rainfall and Soil Moisture Deficit, W73-04528

2A

FLOOD FREQUENCY

On the Time When the Extreme Flood Occurs, W73-04210

2E

Some Generalized Characteristics of the Floods and Droughts of the Lower Mekong, W73-04380

2E

FLOOD PLAINS

Overbank Sedimentation in the Delaware River Valley During the Last 6000 Years, W73-04194

2J

Shape Effects on Resistance in Flood-Plain Channels, W73-04213

8B

FLOOD PROFILES

Flood of September 20-23, 1969, in the Gadsden County Area, Florida, W73-04535

2E

FLOOD PROTECTION

Plaquemine Lock Closure, Mississippi River and Tributaries Project, Iberville Parish, Louisiana, Associated Water Features, Bayou Plaquemine and Gulf Intracoastal Waterway (Final Environmental Impact Statement). W73-04457

8D

East Fork of Whitewater River, Indiana and Ohio (Final Environmental Impact Statement). W73-04458

8A

FLOOD RECURRENCE INTERVAL

On the Time When the Extreme Flood Occurs, W73-04210

2E

FLOOD ROUTING

Unit-Response Method of Open-Channel Flow Routing, W73-04215

8B

FLOOD WAVES

Amplification Criterion of Gradually Varied, Single Peaked Waves, W73-04097

8B

Unit-Response Method of Open-Channel Flow Routing, W73-04215

8B

FLOODS

Historic Flood on the Tisza River, May 12-18, 1970 (Vydavushchiya dozhdovoy pavodok na r. Tise 12-18 maya 1970 g.), W73-04112

2E

Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschety maksimal'nykh raskhodov vody dozhdovykh pavodkov na gornykh rekakh Kryma), W73-04115

2E

A Comparison of Morphometric Measures of Bankfull, W73-04375

2E

Some Generalized Characteristics of the Floods and Droughts of the Lower Mekong, W73-04380

2E

FLORA

New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin (Novyye dannyye o diatomovyykh vodoroslyakh otdozhennii boreal'noy transgressii v basseyne r. Vagi), W73-04517

2J

FLORIDA

Hydrographic Observations in Tampa Bay, Florida-1969, W73-03926

5A

Adjustable Drive Units Solve Seasonal Waste Water Treatment Problems, W73-04009

5D

Hydrologic Aspects of Freshening Upper Old Tampa Bay, Florida, W73-04094

2H

Flood of September 20-23, 1969, in the Gadsden County Area, Florida, W73-04535

2E

Construction of Waste-Injection Monitor Wells Near Pensacola, Florida, W73-04536

5E

A Hydrologic Description of Lake Magdalene Near Tampa, Florida, W73-04537

7C

FLOTATION

Bulletin on Waste Water Clean-Up Process, W73-04156

5D

FLOURINE COMPOUNDS

Reduction of Aromatic Fluorine Compounds, W73-04412

5B

FLOW AROUND CYLINDERS

Computer Model of Vortex Shedding from a Cylinder, W73-04216

8B

FLOW AROUND OBJECTS

Computer Model of Vortex Shedding from a Cylinder, W73-04216

8B

FLOW CHARACTERISTICS

Rheology of Friction-Reducing Polymer Solutions, W73-03913

8B

FLOW FORECASTING

Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries, W73-04063

4A

FLUID MECHANICS

Rheology of Friction-Reducing Polymer Solutions, W73-03913

8B

Pertinent Data on Spillway Tainter Gates for Corps of Engineers Projects, W73-04377

8C

FLUORIDES

Fluoroide Ion Activity Electrode as a Suitable Means for Exact Direct Determination of Uranium Fluoride, W73-04415

5A

FOAM MATERIAL

Oil Spillage Control Process, W73-04129

5G

FOOD CHAINS

Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico, W73-04241

5C

Stable Element Concentrations and Estimations of the Radionuclide Contents in the Fish and Invertebrates Sampled from the Waters Adjaacent to Panama and Columbia, W73-04307

5C

Fallout Program. Quarterly Summary Report, June 1, 1972 Through Sept. 1, 1972, W73-04315

5B

Seasonal Concentration, Turnover, and Mode of Accumulation of p32 by the Juvenile Starry Flounder in the Columbia River Estuary, Platichthys Stellatus (Pallas), W73-04322

5C

Effects of Introductions of Salmonids into Barren Lakes, W73-04406

5C

FOOD PROCESSING INDUSTRY

Reduces Effluent from Blanching, W73-04163

5D

Minimizes Fruit Peel Pollution, W73-04284

5D

FOODS

Mercury in Fish - Imported Tinned Fish, (IX. Kwikgehalten van een Aantal Sorten Ingeblikte Vis), W73-04045

5C

FORECASTING

Predicting Effects of Dead Zones on Stream Mixing, W73-04288

5B

FOREIGN COUNTRIES

Sedimentation-Annotated Bibliography of Foreign Literature for 1969 and 1970, Survey No 7, W73-04507

2J

FOREIGN PROJECTS

Ground Water Reconnaissance in the Arghandab River Basin Near Kandahar, Afghanistan, W73-04379

4B

FOREST MANAGEMENT

Concerning Conservation of the Hohe Mark Forest Massif and of the High Valleys of the Schwalm and Its Tributaries at Eisenborn, W73-04523

6G

FOREST SPOILS

Dynamics of the Water and Chemical Properties of Typical and Podzolized Brown Forest Soils in the Maritime Territory (In Russian), W73-03955

2G

FORMATION FACTOR

Methods for the Calculation of True Formation Factors in the Bunter Sandstone of Northwest England, W73-04534

2F

FORT WALTON BEACH (FLORIDA)

Adjustable Drive Units Solve Seasonal Waste Water Treatment Problems, W73-04009

5D

GEOHERMAL STUDIES

FORT WORTH (TEX)						
Water Treatment Plant for Today and Tomorrow, W73-04435	5D					
FOSSIL FUELS						
Energy Resources of the United States, W73-04039	6G					
FOURIER ANALYSIS						
Energy Spectra of Sea Waves from Photographic Interpretation, W73-03939	7B					
FRACUTURE PERMEABILITY						
Water Movement in Undisturbed Swelling Clay Soil, W73-04089	2G					
FRANKLIN COUNTY (MASS)						
An Inventory of the Ponds, Lakes and Reservoirs of Massachusetts, Berkshire and Franklin Counties, W73-04069	2H					
FREEZING						
Utilization of Deep Water Heat in Reservoirs for the Maintenance of Unfrozen Water Areas, W73-04034	2C					
Liquid and Sludge Treatment, W73-04143	5D					
FREQUENCY ANALYSIS						
Principle of Maximum Entropy in Hydrologic Frequency Analysis, W73-04531	7C					
FRESHWATER						
The Uptake of Insecticides by Freshwater Mussels and the Effects of Sublethal Concentrations of Insecticides on These Mussels, W73-03904	5C					
FRESHWATER FISH						
Mercury in Fish - Total Content in Freshwater and Marine Fishes (VII. (Total) Kwikgehalte van Zoetwateren Zeevis), W73-04044	5C					
Effects on Freshwater Fish, W73-04236	5C					
The Limnology and Fishes of Oligotrophic Glacial Lakes in North America (About 1800 A.D.), W73-04401	5C					
FREUNDLICH EQUATION						
Studies on Purification Theories and Mechanism of Activated Sludge. (III) Similarity in Adsorption Mechanism of Activated Sludge and Charcoal, W73-03993	5D					
Studies on Purification Theories and Mechanism of Activated Sludge. (IV) Application of Purification Theories to the Activated Sludge Process, W73-03994	5D					
FRIE RIVER (TEX)						
Frio River, Three Rivers, Texas; Mississippi River at Winona, Minnesota; Survey Results. W73-04463	6G					
FROST						
The Thermal-Water Horticultural Demonstration Project at Springfield, Oregon, W73-04343	5G					
FROST TUBE						
Performance of a Frost-Tube for Determination of Soil Freezing and Thawing Depths, W73-04254	7B					
FROZEN SOILS						
Water Permeability of Frozen Soil in Connection with Anticorrosion Conservation Tillage of Fall-Plowed Soil on Slopes, (In Ukrainian), W73-03916	2G					
FUEL REPROCESSING PLANTS						
The Dose to Man from Atmospheric KR-85, W73-04291	5B					
Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant, W73-04311	5A					
FUELS						
Energy Resources of the United States, W73-04039	6G					
FURROW DRAINAGE						
Optimal Design of Furrow Length of Surface Irrigation, W73-03975	3F					
FURROW IRRIGATION						
Optimal Design of Furrow Length of Surface Irrigation, W73-03975	3F					
GADSDEN COUNTY (FLA)						
Flood of September 20-23, 1969, in the Gadsden County Area, Florida, W73-04535	2E					
GALVESTON BAY						
Hydrographic Survey of the Galveston Bay System, Texas 1963-66, W73-04190	2L					
GAMMA RAYS						
Relation Between Energy and Error Due to Nuclear Statistics for Density Measurement by Gamma Ray Transmission, W73-03964	8D					
GAS CHROMATOGRAPHY						
Quantitative Determination of Nitrilotriacetic Acid and Related Aminopolycarboxylic Acids in Inland Waters: Analysis by Gas Chromatography, W73-04183	5A					
Inexpensive Mercury-Specific Gas Chromatographic Detector, W73-04242	5A					
Raman Spectra-Structure Correlation for Pyrazines. New Method for Obtaining Spectra of Trapped Nanoliter Gas Chromatograph Fractions, W73-04388	5A					
Chromatographic Detection of Water Contaminants, W73-04423	5A					
GAS COLLECTION						
The BIO-Gas Plant: Generating Methane from Organic Wastes, W73-04157	5G					
GAS TURBINES						
Problems and Opportunities in Waste Heat Disposal, W73-04347	5G					
GAUSSIAN NOISE						
Hurst Phenomenon in Turbulence, W73-04206	2E					
GENESEE RIVER BASIN (N.Y. AND PA.)						
Genesee River Basin, New York and Pennsylvania (Final Environmental Impact Statement). W73-04475	8A					
GEODEIC STUDIES						
Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'zovaniya lazerov diya issledovaniya dinamiki lednikovikh pohrovov), W73-04510	2C					
GEOLOGIC FORMATIONS						
Effect of Underlying Formations on Annual Runoff in Lowlands of the Dniester River Basin (Vliyanie na godovoy stok osobennostey podstilayushchey poverhnosty ravninnoy chasti basseyna Dnestra), W73-04117	2E					
GEOLOGIC TIME						
New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin (Novyye dannyye o diatomovkh vodoroslyakh otlozhennii boreal'nyy transgressii v basseyne r. Vagi), W73-04517	2J					
GEOLGY						
Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava), W73-04512	2J					
GEOMORPHOLOGY						
The Morphological Effects of Surges of the Donjek Glacier, St Elias Mountains, Yukon Territory, Canada, W73-03934	2C					
Periodic Surge Origin of Folded Medial Moraines on Bering Piedmont Glacier, Alaska, W73-03935	2C					
Stability and the Conservation of Mass in Drainage Basin Evolution, W73-04202	2A					
A New Topological Relationship as an Indicator of Drainage Network Evolution, W73-04203	4A					
Quantitative Characterization of Channel Network Structure, W73-04204	8B					
Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava), W73-04512	2J					
GEORGIA						
Pond Cleaning Cost Cut 50 Percent by Auger-Equipped Barge. W73-04004	5G					
GEOHERMAL ENERGY						
Beneficial Use of Heat in Iceland, Technical and Economical Aspects and Future Prospects, W73-04348	5G					
GEOHERMAL POWERPLANTS						
Beneficial Use of Heat in Iceland, Technical and Economical Aspects and Future Prospects, W73-04348	5G					
GEOHERMAL STUDIES						
Beneficial Use of Heat in Iceland, Technical and Economical Aspects and Future Prospects, W73-04348	5G					

SUBJECT INDEX

GEOHERMAL STUDIES

Thermal and Mineral Springs in the Southern Rocky Mountains of Canada,
W73-04363 4B

GLACIAL DRIFT

The Pleistocene Moraine Stages of West-Central Peru,
W73-03931 2C

Periodic Surge Origin of Folded Medial Moraines on Bering Piedmont Glacier, Alaska,
W73-03935 2C

Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii),
W73-04513 2C

GLACIAL LAKES

The Limnology and Fishes of Oligotrophic Glacial Lakes in North America (About 1800 A.D.),
W73-04401 5C

GLACIAL SEDIMENTS

Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii),
W73-04513 2C

New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin (Novyye dannyye o diatomovykh vodoroslyakh otlozhennii boreal'noy transgressii v basseyne r. Vagi),
W73-04517 2J

GLACIATION

The Pleistocene Moraine Stages of West-Central Peru,
W73-03931 2C

Use of New Glacier Investigation Techniques in Antarctica (Primeneniye novykh metodov givatsiologicheskikh issledovanii v Antarktide),
W73-04509 2C

Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii),
W73-04513 2C

New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin (Novyye dannyye o diatomovykh vodoroslyakh otlozhennii boreal'noy transgressii v basseyne r. Vagi),
W73-04517 2J

GLACIER FLOW

Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'zovaniya lazerov diya issledovaniya dinamiki lednikovyh pohrovov),
W73-04510 2C

GLACIERS

Water Pressure in Intra- and Subglacial Channels,
W73-03927 2C

Electronic Detection of Serac Avalanches and Glacier Noise at Vaughan Lewis Icefall, Alaska,
W73-03929 2C

Survey of the Rusty Glacier Area, Yukon Territory, Canada, 1967-70,
W73-03932 2C

A Model of a Surging Glacier,
W73-03933 2C

The Morphological Effects of Surges of the Donjek Glacier, St Elias Mountains, Yukon Territory, Canada,
W73-03934 2C

Periodic Surge Origin of Folded Medial Moraines on Bering Piedmont Glacier, Alaska,
W73-03935 2C

Movement of Water in Glaciers,
W73-03936 2C

Use of New Glacier Investigation Techniques in Antarctica (Primeneniye novykh metodov givatsiologicheskikh issledovanii v Antarktide),
W73-04509 2C

Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'zovaniya lazerov diya issledovaniya dinamiki lednikovyh pohrovov),
W73-04510 2C

Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii),
W73-04513 2C

Application of Lasers to Investigation of Glacier Movement (Issledovaniye dinamiki dvizheniya lednikov s pomoshch'yu lazerov),
W73-04518 2C

GLACIERS (SURGING)

Survey of the Rusty Glacier Area, Yukon Territory, Canada, 1967-70,
W73-03932 2C

A Model of a Surging Glacier,
W73-03933 2C

The Morphological Effects of Surges of the Donjek Glacier, St Elias Mountains, Yukon Territory, Canada,
W73-03934 2C

Periodic Surge Origin of Folded Medial Moraines on Bering Piedmont Glacier, Alaska,
W73-03935 2C

Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii),
W73-04513 2C

GLACIO-FLUVIATILE SEDIMENTS

Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii),
W73-04513 2C

GLACIO-LACUSTRINE SEDIMENTS

Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii),
W73-04513 2C

GLACIOHYDROLOGY

Water Pressure in Intra- and Subglacial Channels,
W73-03927 2C

Movement of Water in Glaciers,
W73-03936 2C

GLACIOLOGY

The Pleistocene Moraine Stages of West-Central Peru,
W73-03931 2C

Survey of the Rusty Glacier Area, Yukon Territory, Canada, 1967-70,
W73-03932 2C

A Model of a Surging Glacier,
W73-03933 2C

Use of New Glacier Investigation Techniques in Antarctica (Primeneniye novykh metodov givatsiologicheskikh issledovanii v Antarktide),
W73-04509 2C

Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'zovaniya lazerov diya issledovaniya dinamiki lednikovyh pohrovov),
W73-04510 2C

Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii),
W73-04513 2C

Application of Lasers to Investigation of Glacier Movement (Issledovaniye dinamiki dvizheniya lednikov s pomoshch'yu lazerov),
W73-04518 2C

GLASSWARE

Large, Inexpensive Oven used to Decontaminate Glassware for Environmental Pesticide Analysis,
W73-04394 5A

GOVERNMENTAL CONTROL

Doing Time Takes on a New Meaning for the Wastemakers,
W73-04010 5G

GOVERNMENTS

A Study of Water Institutions of Hawaii,
W73-04062 6B

GRADIENT MAPS

Contribution to Methods of Applied Investigations of Soil Erosion on the Right Bank of the Volga in the Gorki Region, (In Russian),
W73-04053 2J

GRADUALLY VARIED FLOW

Unified Nondimensional Formulation for Open Channel Flow,
W73-04223 8B

GRAIN-BOUNDARY ENERGY (ICE)

Grain-Boundary Energy and Grain-Boundary Groove Angles in Ice,
W73-03930 2C

GRAND RIVER

Environmental Chemistry: Grand River Studies,
W73-04305 5B

GRAPHITE COATING

Dry Graphite Film Protects Treatment Plant Units,
W73-04444 8G

GRASS CARP

Propagation of Grass Carp and Silver Carp, (In Korean),
W73-04261 8I

GRAVEL COVERED PLASTIC

Development of Economic Water Harvest Systems for Increasing Water Supply - Phase II,
W73-03901 3B

GREAT BRITAIN

Doing Time Takes on a New Meaning for the Wastemakers,
W73-04010 5G

SUBJECT INDEX

	HEAT
Loch Lomond: Man's Effects on the Salmonid Community, W73-04407	5C
Higher Standards: The Local Authorities View, W73-04492	5F
Effluent Standards From the Viewpoint of the Industrialist, W73-04493	5G
GREAT LAKES	
Lake Ice Surveillance Via Airborne Radar: Some Experimental Results, W73-03937	7B
Wave Climate Study: Great Lakes and Gulf of St. Lawrence--Volume II, Appendices A, B, and C, W73-04103	2H
Transient Analysis of the Detroit River by the Implicit Method, W73-04207	2E
Wind-Induced and Thermally Induced Currents in the Great Lakes, W73-04208	2H
Strontium-90 in the Great Lakes: Concentration-Time Model, W73-04296	5A
Factors of Ecologic Succession in Oligotrophic Fish Communities of the Laurentian Great Lakes, W73-04399	5C
GREENHOUSES	
Waste Heat Use in Controlled-Environment Greenhouses, W73-04345	5G
Beneficial Use of Heat in Iceland, Technical and Economical Aspects and Future Prospects, W73-04348	5G
GREENLAND	
Vegetation of the Mesters Vig District, Northeast Greenland: General Summary and Discussion, W73-04264	2I
GROUNDWATER	
Water Inflow into Hole UA-1, Amchitka Island, Alaska, W73-03919	5A
Determination of a Water Table in a Soil Profile Using the Platinum Oxygen Cathode, W73-03985	2G
Brucine Analysis for High Nitrate Concentrations, W73-04000	5A
Thermal Pollution of Ground Water by Artificial Recharge, W73-04038	5B
Studies of the Influence of Lagoons and Landfills on Groundwater Quality, W73-04066	5B
Ground-Water Levels in the South Platte River Valley of Colorado, 1968-72, W73-04211	7C
Water Resources of Ouachita Parish, Louisiana, W73-04504	4B
GROUNDWATER MAPPING	
Summary of Panel on Carbon Isotopes in Subsurface Hydrology and the Role of Paleoclimate in their Interpretation, W73-03957	2F
GROUNDWATER MOVEMENT	
Electrical Earth Resistivity Surveying in Landfill Investigations, W73-03918	5B
Summary of Panel on Carbon Isotopes in Subsurface Hydrology and the Role of Paleoclimate in their Interpretation, W73-03957	2F
The Effect of the Entrapped Air on the Hysteresis Curves of A Porous Body and on its Hydraulic Conductivity, W73-03969	2G
Seepage From Shallow Reservoir, W73-04221	4A
Dispersion From Pit in Uniform Seepage, W73-04222	5B
Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report, W73-04290	5B
Nonuniform Groundwater-Conduit Discharge and Head Loss, W73-04362	2F
The Lateral Inflow into Submerged Drains, W73-04384	8B
An Attempt at Estimating the Transmissibilities of Trappean Aquifers from Specific Capacity Values, W73-04527	2F
GROUNDWATER RESOURCES	
Electromagnetic Pulse Sounding for Surveying Underground Water, W73-03912	7B
Water Supply for the Nuclear Rocket Development Station at the U.S. Atomic Energy Commission's Nevada Test Site, W73-04370	4B
Ground Water Reconnaissance in the Arghandab River Basin Near Kandahar, Afghanistan, W73-04379	4B
Ground Water in the Plaquemine-White Castle Area, Iberville Parish, Louisiana, W73-04502	4B
Water Resources of Union Parish, Louisiana, W73-04503	4B
GROUP D ENTEROCOCCI	
Improved Procedure for Identification of Group D Enterococci with Two New Media, W73-04253	5A
GROWTH (MOSES)	
Growth Form and Water Relations of Mosses in the Maritime Antarctic, W73-04259	2C
GROWTH POTENTIAL	
Algal Assay Procedure, W73-04404	5A
GROWTH RATES	
Temperature Tolerance of Pathogenic and Non-pathogenic Free-Living Amoebas, W73-04330	5C
HEAT	
Control of Growth Rate by Initial Substrate Concentration at Values Below Maximum Rate, W73-04499	5C
Effects of Elevated Temperature of Juvenile Coho Salmon and Benthic Invertebrates in Model Stream Communities, W73-04545	5C
GUADALUPE RIVER (TEX)	
The Physicochemical Limnology of a Stretch of the Guadalupe River, Texas, With Five Main-Stream Impoundments, W73-04505	2H
GULF OF PANAMA	
Stable Element Concentrations and Estimations of the Radionuclide Contents in the Fish and Invertebrates Sampled from the Waters Adjacent to Panama and Columbia, W73-04307	5C
Characterization of the Sediments from the Tuira and Sabana River Estuaries, W73-04308	5C
GULF OF ST. LAWRENCE	
Wave Climate Study: Great Lakes and Gulf of St. Lawrence--Volume II, Appendices A, B, and C, W73-04103	2H
HARBORS	
Effects of Proposed Runway Extensions at Laguardia Airport on Tides, Currents, Shoaling, and Dye Dispersion, W73-04096	8B
Marina Del Rey: A Study of Environmental Variables in a Semi-Enclosed Coastal Water, W73-04197	5B
Murrells Inlet, South Carolina: Northport Harbor, Wisconsor, Wiscosin. W73-04453	6E
A Study of the Need for and Feasibility of a Program for the Removal and Disposal of Drift and Other Debris, Including Abandoned Vessels, from the Public Harbors and Associated Channels Under the Jurisdiction of the Dep artment of the Army. W73-04455	8A
Planning for Coastal Ports on a Systems Basis: Preliminary Methodological Design, W73-04525	8A
HAWAII	
A Study of Water Institutions of Hawaii, W73-04062	6B
Wastewater Reclamation by Irrigation, W73-04480	5D
HEAT	
The Nuclear Plant Controversy - II: Power and Hot Water, W73-04023	5C
Potential Thermal Effects of an Expanding Power Industry: Columbia River Basin, W73-04024	5C
Coping with Heated Waste Water Discharges from Steam-Electric Power Plants, W73-04026	5C
Power Plant Cooling Systems, W73-04029	5D

SUBJECT INDEX

HEAT

Logical Approaches to Power Supply and Environment, W73-04036	5G	HEATED WATER Thermal Pollution of Ground Water by Artificial Recharge, W73-04038	5B	Activation Analysis of Mercury and Other Environmental Pollutants in Water and Aquatic Ecosystems, W73-04051	5A
Impact of Cooling Water on Lake Temperatures, W73-04037	5B	Reclaiming Cooling Tower Blowdown, W73-04040	5D	A Physicochemical Rationale for the Biological Activity of Mercury and Its Compounds, W73-04054	5C
Conference on Beneficial Uses of Thermal Discharges, W73-04337	5G	Development of Systems in Marine Fish Cultivation in the United Kingdom, W73-04339	5G	Mercury Pollution, W73-04055	5B
Problems and Opportunities in Waste Heat Disposal, W73-04347	5G	Mariculture in Japan Using Heated Effluent Water, W73-04340	5G	Factors Affecting Plant Uptake and Phytotoxicity of Cadmium Added to Soils, W73-04058	5B
Agricultural and Urban Uses of Low-Temperature Heat, W73-04349	5G	Catfish Farming - Beneficial Use of Waste Heat, W73-04341	5G	On the State of Mercury (II) Traces in Aqueous Solutions - Colloidal Behavior of Mercury, W73-04126	5A
Combination Urban-Power Systems Utilizing Waste Heat, W73-04350	5G	Biological Limitations on the Use of Waste Heat in Aquaculture, W73-04342	5G	Nuclear Activation Analysis of Se, As, Zn, Cd, and Hg in Environmental Matrices, W73-04328	5A
Beneficial Uses of Waste Heat - An Evaluation, W73-04351	5G	The Thermal-Water Horticultural Demonstration Project at Springfield, Oregon, W73-04343	5G	Activation analysis of Heavy Metals in Surface Waters Using Ion Exchange Filter Paper and Cyanide Complexing, W73-04329	5A
HEAT REJECTION		Waste Heat Use in Controlled-Environment Greenhouses, W73-04345	5G	Combined Ion Exchange-Solvent Extraction (Ciese) Studies of Metal Ions on Ion Exchange Papers, W73-04414	5A
A Procedure for Estimating Costs of Thermal Effluent Modifications for Existing Steam-Electric Generating Stations, W73-04071	5G	An Independent View of the Use of Thermal Power Station Cooling Water to Supplement Inter-Regional Water Supply, W73-04346	5G	Ion Exchange for the Metal Products Finisher-Part I, W73-04497	5D
HEAT TRANSFER		Problems and Opportunities in Waste Heat Disposal, W73-04347	5G	HEIGHT	
Reclaiming Cooling Tower Blowdown, W73-04040	5D	Beneficial Use of Heat in Iceland, Technical and Economical Aspects and Future Prospects, W73-04348	5G	Wave Climate Study: Great Lakes and Gulf of St. Lawrence--Volume II, Appendices A, B, and C, W73-04103	2H
Hydraulic Roughness of Ice Covers, W73-04218	2C	Agricultural and Urban Uses of Low-Temperature Heat, W73-04349	5G	HELMINTHS	
HEAT USE		Combination Urban-Power Systems Utilizing Waste Heat, W73-04350	5G	Lysimetric Method of Examining the Degree of Dehelminthization of Sewage (In Russian), W73-04448	5D
Beneficial Use of Heat in Iceland, Technical and Economical Aspects and Future Prospects, W73-04348	5G	Beneficial Uses of Waste Heat - An Evaluation, W73-04351	5G	HERBICIDES	
HEAT USES		HEATED WATERS		Evaluation of Herbicides for Possible Mutagenic Properties, W73-04233	5C
Trends of Power Generation and Thermal Discharges in New York State, W73-04338	5G	Marine Life in the Morro Bay Power Plant Discharge Canal, W73-04031	5C	HIGH VOLTAGE	
Mariculture in Japan Using Heated Effluent Water, W73-04340	5G	HISTORIC FLOODS		New Structural Designs for H. V. Transmission Towers, W73-04078	8C
Catfish Farming - Beneficial Use of Waste Heat, W73-04341	5G	Historic Flood on the Tisza River, May 12-18, 1970 (Vydavushchiya dozhdovoy pavodok na r. Tise 12-18 maya 1970 g.), W73-04112	2E		
Biological Limitations on the Use of Waste Heat in Aquaculture, W73-04342	5G	HISTORY			
The Thermal-Water Horticultural Demonstration Project at Springfield, Oregon, W73-04343	5G	Hydrologic Studies in Northern Algeria (O gidrologicheskij i zuchenostji territorii Severnogo Alzirja), W73-04120	2E		
Agricultural and Urban Uses of Low-Temperature Heat, W73-04349	5G	HOLLAND			
Beneficial Uses of Waste Heat - An Evaluation, W73-04351	5G	Mercury in Fish - Total Content in Freshwater and Marine Fishes (VII. (Total) Kwikgehalte van Zoetwateren Zeevis), W73-04044	5C		
HEAT UTILIZATION		HOLLOW GRAVITY DAMS			
Development of Systems in Marine Fish Cultivation in the United Kingdom, W73-04339	5G	Uplift Computations for Hollow Gravity Dams, W73-04083	8A		

SUBJECT INDEX

HYDROPHONES

HORIZONTAL MOVEMENT	River Basin Monetary Authorizations—1969, Chesapeake Bay Basin in Comprehensive Study, W73-04073	SD	HYDROLOGIC ASPECTS	Hydrologic Aspects of Freshening Upper Old Tampa Bay, Florida, W73-04094	2H
Movements in Dams Due to Reservoir Filling,					
HORTICULTURE	Roughness in a Model of Overland Flow, W73-04508	8B	HYDROLOGIC DATA	Flood Forecasting in the Upper Midwest - Data Assembly and Preliminary Analysis, W73-03906	4A
The Thermal-Water Horticultural Demonstration Project at Springfield, Oregon, W73-04343		5G			
Waste Heat Use in Controlled-Environment Greenhouses,	Pertinent Data on Spillway Tainter Gates for Corps of Engineers Projects, W73-04377	8C		Gazetteer of Natural Drainage Areas of Streams and Water Bodies within the State of Connecticut, W73-03914	7C
W73-04345		5G			
HOUSTON BLACK CLAY	Computer Model of Vortex Shedding from a Cylinder, W73-04216	8B		On-Site Digital Accumulation and Storage of Hydrologic Data for Use in Data Acquisition Systems, W73-04067	7C
Anion Exclusion Effects on Chloride Movement in Soils, W73-03973		2K			
HUMIDITY	Hydrobiots' Adaptation to a Toxic Factor, (In Russian), W73-04500	5C		Bathymetric Reconnaissance of Mariette and Spooner Lakes, Washoe County and Carson City, Nevada, W73-04100	7C
On the Correlation of the Total Precipitable Water in a Vertical Column and Absolute Humidity at the Surface, W73-03923		2B			
Literature Search for Atmospheric Humidity Profile Models from the Sea Surface to 1,000 Meters, W73-04332	Flocculant Production from Kerosene, W73-04245	5B		Hydrologic Studies in Northern Algeria (O gidrologicheskoy i zuchenosti territorii Severnogo Alzirha), W73-04120	2E
Use of Surface Observations in Boundary-Layer Analysis, W73-04333	Pumped Storage and Tidal Power in Energy Systems, W73-04033	5G			
HUMUS PROPERTIES (SOIL)	Hydrogen Ion Concentration			Bathymetric Reconnaissance of Topaz Lake, Nevada and California, W73-04192	7C
Moisture Regime of Sod Podzolic Soils in Different Farmlands, (In Russian), W73-04269	Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	5D			
HURST PHENOMENON	Losses of 65 ZN To Inorganic Surfaces in a Marine Algal Nutrient Medium, W73-04011	5C		Bathymetric Reconnaissance of Rye Patch Reservoir and the Pitt-Taylor Reservoirs, Pershing County, Nevada, W73-04227	7C
Hurst Phenomenon in Turbulence, W73-04206	Inhibiting Water Formed Deposits with Threshold Compositions, W73-04166	5D			
HYBRID COMPUTERS	Preventive Maintenance and Operational Know-How Improve Waste Treatment Systems, W73-04278	5D		A Hydrologic Description of Lake Magdalene Near Tampa, Florida, W73-04537	7C
Computer-Aided Visual Spectrum Analysis, W73-04234	Reduction of Chromate by Zinc at Constant pH's. Chemistry of Chromate Treatment: (Part 2) (In Japanese), W73-04282	5D	HYDROLOGY	Summary of Panel on Carbon Isotopes in Sub-surface Hydrology and the Role of Paleoclimates in their Interpretation. W73-03957	2F
HYDRAULIC CONDUCTIVITY	An Evaluation of Procedures for Enumerating Bacteria in Activated Sludge, W73-04450	5A		Non-Linear Thermodynamics of Soil-Water-Heat Systems, W73-03960	2G
Soil Hydraulic Conductivity and Bulk Volume Changes During Cyclic Calcium-Sodium Exchange, W73-03965	HYDROGEN ION CONCENTRATION CONTROL	2K		Thermodynamics of Soil-Water System, W73-03961	2G
Rapid Measurement of Hydraulic Conductivity Changes in Slowly Permeable Soils, W73-03968	Tannery Effluents and Their Treatment-Conclusion, W73-04488	2G		Hydrologic Regimen of Lower Tonto Creek Basin, Gila County, Arizona—A Reconnaissance Study, W73-04099	3B
The Effect of the Entrapped Air on the Hysteresis Curves of A Porous Body and on its Hydraulic Conductivity, W73-03969	HYDROGEOLOGY	2G		Investigation and Calculation of Components in the Hydrologic Regime of Rivers (Issledovaniya i raschety elementov gidrologicheskogo rezhima rek). W73-04111	2E
The Effect of Electrolyte Composition on Hydraulic Conductivity of Certain Texas Soils, W73-03986	Movement of Water in Glaciers, W73-03936	2C		Hydrologic Studies in Northern Algeria (O gidrologicheskoy i zuchenosti territorii Severnogo Alzirha), W73-04120	2E
Rapid Measurement of Hydraulic Conductivity Changes in Slowly Permeable Soils, W73-03988	Sensitivity of Groundwater Flow Models to Vertical Variability of Aquifer Constants, W73-04065	2F			
The Changeability of the Hydraulic Conductivity of Saturated Soil Samples, W73-04108	An Attempt at Estimating the Transmissibilities of Trappean Aquifers from Specific Capacity Values, W73-04527	2F	HYDROLYSIS	Wastewater Treatment Sequence, W73-04146	5D
HYDRAULIC CONDUCTIVITY MEASUREMENT	HYDROGRAPH ANALYSIS				
Rapid Measurement of Hydraulic Conductivity Changes in Slowly Permeable Soils, W73-03986	Unit-Response Method of Open-Channel Flow Routing, W73-04215	2E		Electronic Detection of Serac Avalanches and Glacier Noise at Vaughan Lewis Icefall, Alaska, W73-03929	2C
HYDRAULIC MODELS					
Longitudinal Dispersion in Sinuous Channels, W73-04214		5B			
Exact Nonlinear Model of Wave Generator, W73-04220		2E			

SUBJECT INDEX

HYDROPHONICS

HYDROPHONICS
Conquest of Wastes Show Productivity.
W73-03979 3F

HYDROSTATIC PRESSURE

Hydrostatics in Swelling Soils and Soil Suspensions: Unification of Concepts,
W73-03982 8D

HYPERBOLIC RELATIONSHIPS

Control of Growth Rate by Initial Substrate Concentration at Values Below Maximum Rate,
W73-04499 5C

HYPORREIC GROUNDWATER

New Species of Parastenocaris (Crustacea, Copepoda) of the Hyporreic Ground Water of the Liscia River (Sardinia), (In Italian),
W73-04378 5C

HYSTERESIS

The Effect of the Entrapped Air on the Hysteresis Curves of A Porous Body and on its Hydraulic Conductivity,
W73-03969 2G

IBERVILLE PARISH (LA)

Ground Water in the Plaquemine-White Castle Area, Iberville Parish, Louisiana,
W73-04502 4B

ICE

Grain-Boundary Energy and Grain-Boundary Groove Angles in Ice,
W73-03930 2C

Numerical Modeling of the Growth of Ice Crystals, Graupel, and Hail,
W73-04104 2C

Ice Analyses. Data From Three Norwegian Lakes,
W73-04506 2C

Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'zovaniya lazerov dlya issledovaniya dinamiki lednikovykh pohrovov),
W73-04510 2C

ICE COVER

Hydraulic Roughness of Ice Covers,
W73-04218 2C

ICE FALLS

Electronic Detection of Serac Avalanches and Glacier Noise at Vaughan Lewis Icefall, Alaska,
W73-03929 2C

ICE JAMS

Utilization of Deep Water Heat in Reservoirs for the Maintenance of Unfrozen Water Areas,
W73-04034 2C

ICE SHEETS

Use of New Glacier Investigation Techniques in Antarctica (Primeneniye novykh metodov glaciologicheskikh issledovanii v Antarktide),
W73-04509 2C

Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'zovaniya lazerov dlya issledovaniya dinamiki lednikovykh pohrovov),
W73-04510 2C

ICE SHELVES

Use of New Glacier Investigation Techniques in Antarctica (Primeneniye novykh metodov glaciologicheskikh issledovanii v Antarktide),
W73-04509 2C

ICE THICKNESS

Use of New Glacier Investigation Techniques in Antarctica (Primeneniye novykh metodov glaciologicheskikh issledovanii v Antarktide),
W73-04509 2C

ICE-WATER INTERFACES

Hydraulic Roughness of Ice Covers,
W73-04218 2C

ICED LAKES

Radar Cross-Section Measurements of Snow and Ice,
W73-03920 2C

ICELAND

Beneficial Use of Heat in Iceland, Technical and Economical Aspects and Future Prospects,
W73-04348 5G

ILLINOIS

Study of Rainout of Radioactivity in Illinois.
W73-04052 5B

IMIDES

Use of Potassium Phthalimide for Identification of Alkylene Bis Halides and Bis Sulfonates,
W73-04416 5A

IMPACT (RAINFALL)

Dynamics of the Soil-Water System During a Rainstorm,
W73-04107 2G

EROSION

Erosion Sediment Production,
W73-04358 2J

IMPEDING LAYER

Measurement of Unsaturated Conductivity and Diffusivity by Infiltration Through an Impeding Layer,
W73-03971 2G

IMPLICIT METHOD

Streamflow Routing (With Applications to North Carolina Rivers),
W73-03908 4A

IMPORTED WATER

Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W73-04277 6D

IMPOUNDMENTS

Nitrogen and Phosphorus Dynamics in Three Central Texas Impoundments,
W73-04484 5C

INCINERATION

Handling and Disposal of Chemical Wastes,
W73-04008 5D

INDEXING

Indexed Bibliography of Thermal Effects Literature - 1,
W73-04020 5C

INDIA

An Attempt at Estimating the Transmissibilities of Trappean Aquifers from Specific Capacity Values,
W73-04527 2F

INDIAN OCEAN

Relationship Between Circulation and Structure of Waters of the Indian Ocean (O vzaimovyyazi tsirkulyatsii i struktury vod Indiyskogo okeana),
W73-04515 2E

Paleomagnetic Studies of Bottom Sediments from the Indian Ocean Area of the Antarctic (Paleomagnitnye issledovaniya donnykh otlozhennykh Indiyskogo sektora Antarktiki),
W73-04516 2J

INDIANA

East Fork of Whitewater River, Indiana and Ohio (Final Environmental Impact Statement),
W73-04458 8A

INDIUM

Evaluation of Treatment Plants by Tracer Methods. Annual Report, Jan. 1971-Jan. 1972,
W73-04297 5B

INDUSTRIAL WASTES

Adsorption Process Eases Acid Recovery.
W73-04005 5D

Handling and Disposal of Chemical Wastes,
W73-04008 5D

Recovers Salable Products from Waste Yeast,
W73-04014 5D

Waste Acid to be Recovered and Refused.
W73-04015 5D

Thermal Pollution of Ground Water by Artificial Recharge,
W73-04038 5B

Fluid Pollution Eradicator System Including an Air Bubble Scrubbing Unit,
W73-04137 5D

Bulletin on Waste Water Clean-Up Process.
W73-04156 5D

Industrial Waste Can Be An Asset.
W73-04280 5D

Minimizes Fruit Peel Pollution,
W73-04284 5D

Electronic Spectra of 2-Aminoquinoline and 4-Aminoquinidine. Evidence for the Cyclic Amidine Structure of the Singly Protonated Cations,
W73-04389 5A

The Polluted Waters in Umbria: III. The River Nestore, (In Italian),
W73-04393 5B

Algal Assay Procedure,
W73-04404 5A

Water Pollution Control in Pulp and Paper Industry,
W73-04424 5D

What is Expected in In-Plant Control and Waste Treatment in the Future,
W73-04437 5D

Corporate Checkpoints to Pollution Control,
W73-04483 5G

SUBJECT INDEX

INVERTEBRATES

Effluent Standards as Proposed by the Royal Commission on Sewage Disposal, W73-04491	SG	Inexpensive Mercury-Specific Gas Chromatographic Detector, W73-04242	5A
Effluent Standards From the Viewpoint of the Industrialist, W73-04493	SG	Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'zovaniya lazerov diya issledovaniyu dinamiki lednikovykh pohrovov), W73-04510	2C
Lake Michigan Clean-Up Laging. W73-04547	SD	Application of Lasers to Investigation of Glacier Movement (Issledovaniyu dinamiki dvizheniya lednikov s pomoshch'yu lazera), W73-04518	2C
INFILTRATION		INTERCEPTION	
Measurement of Unsaturated Conductivity and Diffusivity by Infiltration Through an Impeding Layer, W73-03971	2G	Interception of Rain by Forest Vegetation-Estimation of Daily Interception Using a Mathematical Model (Interception de la pluie par la vegetation forestiere—estimation de l'interception journaliere a l'aide d'un modele mathematique), W73-04530	2A
Studies of the Influence of Lagoons and Landfills on Groundwater Quality, W73-04066	SB	INTERCEPTOR SEWERS	
Soil Air Pressure and Water Infiltration Under Border Irrigation, W73-04087	2G	Sewer Service Gamble Worth \$120,000, W73-04434	SG
Solutions for Miscible Displacement of Soil Water with Time-Dependent Velocity and Dispersion Coefficients, W73-04090	2G	INTERFERENCE	
The Numerical Analysis of Infiltration Into Heterogeneous Porous Media, W73-04091	2G	3-Propyl-5-Hydroxy-5-D-Arabinotetrahydroxybutyl-3-Thiazolidine-2-Thione, A Specific Colorimetric Reagent for the Determination of Copper in Water, W73-04056	5A
Horizontal Infiltration into Layered Soils, W73-04092	2G	INTERGLACIAL	
Theory of Water Movement in Soils: 4. Two and Three Dimensional Steady Infiltration, W73-04106	2G	New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin (Novyye dannyye o diatomovykh vodoroslyakh otlozhenii boreal'noy transgressii v basseyne r. Vagi), W73-04517	2J
Dynamics of the Soil-Water System During a Rainstorm, W73-04107	2G	INTERNATIONAL COMMISSIONS	
Theory of Water Movement in Soils: 5. Unsteady Infiltration From Spherical Cavities, W73-04225	2G	Law of the Sea. W73-04465	6E
Comparison of Recharge to Groundwater Under Pasture and Forest Using Environmental Tritium, W73-04373	2F	INTERSTATE COMMISSIONS	
Water Table Fluctuations Under Forest and Pasture in a Karstic Region of Southern Australia, W73-04374	2F	Conference in the Matter of Pollution of the Interstate Waters of the Merrimack and Nashua Rivers and Their Tributaries, Massachusetts-New Hampshire and the Intrastate Portions of Those Waters Within the State of Massachusetts. W73-04469	SG
The Infiltration Envelope: Results From a Theoretical Infiltrometer, W73-04376	2G	INTERSTATE RIVERS	
INFILTRATION FROM CAVITIES		Conference in the Matter of Pollution of the Interstate Waters of the Merrimack and Nashua Rivers and Their Tributaries, Massachusetts-New Hampshire and the Intrastate Portions of Those Waters Within the State of Massachusetts. W73-04469	SG
Theory of Water Movement in Soils: 4. Two and Three Dimensional Steady Infiltration, W73-04106	2G	INVERTEBRATES	
INFILTRATION (HORIZONTAL)		Toxic Effects of the Mycotoxins Aflatoxin B1, Rubratoxin B, Patulin, and Diacetoxyscirpenol on the Crustacean Cyclops fuscus, W73-04395	SC
Horizontal Infiltration into Layered Soils, W73-04092	2G	Consumption of Oligochaete Worms by Fish and Invertebrates, (In Russian), W73-04520	2I
INFILTRATION RATES		Effects of Elevated Temperature of Juvenile Coho Salmon and Benthic Invertebrates in Model Stream Communities, W73-04545	SC
Transient Infiltration into Crust-Topped Profiles, W73-03976	2G		
INFORMATION RETRIEVAL			
Control of Copper Electroplating Wastes: An Annotated Bibliography, W73-04467	SG		

SUBJECT INDEX

INVESTIGATIONS

INVESTIGATIONS

Hydrologic Studies in Northern Algeria (O hidrologicheskoy i zuchenosti territorii Severnogo Alzira),
W73-04120

2E

INVESTMENT

Learning, External Benefits, and Subsidies in Water Desalination,
W73-04274

6B

IODINE-129

Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant,
W73-04311

5A

IODINE RADIOISOTOPES

Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant,
W73-04311

5A

ION EXCHANGE

Soil Hydraulic Conductivity and Bulk Volume Changes During Cyclic Calcium-Sodium Exchange,
W73-03965

2K

Anion Exclusion Effects on Chloride Movement in Soils,
W73-03973

2K

Method and Apparatus for Softening or Desalting Water by Ion Exchange,
W73-04133

3A

Combined Ion Exchange-Solvent Extraction (Ciese) Studies of Metal Ions on Ion Exchange Papers,
W73-04414

5A

Ion Exchange for the Metal Products Finisher-Part I,
W73-04497

5D

ION EXCHANGE

Ion Exchange Resin for Removal of Heavy Metal Ions in Waste Water,
W73-04047

5D

ION SELECTIVE ELECTRODES

Fluoride Ion Activity Electrode as a Suitable Means for Exact Direct Determination of Urinary Fluoride,
W73-04415

5A

ION TRANSPORT

A Rapid Method of Measurement of Diffusion Coefficients in Aqueous Solutions,
W73-03966

2K

Solutions for Miscible Displacement of Soil Water with Time-Dependent Velocity and Dispersion Coefficients,
W73-04090

2G

The 1971 Tritium Symposium at Las Vegas,
W73-04318

5A

IONS

Combined Ion Exchange-Solvent Extraction (Ciese) Studies of Metal Ions on Ion Exchange Papers,
W73-04414

5A

IOWA

Sewer Service Gamble Worth \$120,000,
W73-04434

5G

IRON

Iron and Silica in Water, Acid Ammonium Oxalate, and Dithionite Extracts of Some North Carolina Coastal Plain Soils,
W73-04088

2G

Effect of the Soil Moisture Content on the Mobility of Iron and Manganese (In Russian),
W73-04255

2G

IRON BACTERIA

Microbiology of Water,
W73-04235

5B

IRON COMPOUNDS

Industrial Waste Can Be An Asset,
W73-04280

5D

IRON OXIDES

Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils,
W73-03983

2K

IRRADIATION

Treatment of Sewage,
W73-04139

5D

IRRIGATION

The Thermal-Water Horticultural Demonstration Project at Springfield, Oregon,
W73-04343

5G

Agricultural and Urban Uses of Low-Temperature Heat,
W73-04349

5G

IRRIGATION EFFECTS

Radioecology and Ecophysiology of Desert Plants at the Nevada Test Site,
W73-04300

5C

IRRIGATION EFFICIENCY

Irrigation Guesswork - Goodbye,
W73-03962

3F

IRRIGATION PRACTICES

Bold New Development for Irrigation,
W73-03956

3F

Irrigation Guesswork - Goodbye,
W73-03962

3F

IRRIGATION SURVEY

Irrigation Survey,
W73-03980

3F

IRRIGATION PROGRAMS

Bold New Development for Irrigation,
W73-03956

3F

Irrigation Guesswork - Goodbye,
W73-03962

3F

Bold New Development for Irrigation,
W73-03956

3F

IRRIGATION RESEARCH

Bold New Development for Irrigation,
W73-03956

3F

Starting with Trickle Irrigation,
W73-03958

3C

Irrigation Guesswork - Goodbye,
W73-03962

3F

IRRIGATION SCHEDULING

Bold New Development for Irrigation,
W73-03956

3F

Irrigation Guesswork - Goodbye,
W73-03962

3F

Bold New Development for Irrigation,
W73-03956

3F

Soil-Water Relationship,

W73-03981

3F

IRRIGATION SYSTEMS

Trickle Irrigation...A More Efficient Means of Water Management,
W73-03953

3C

Starting with Trickle Irrigation,
W73-03958

3C

Center Pivot Irrigation,
W73-03978

3F

Irrigation Survey,
W73-03980

3F

To Authorize Construction, Operation and Maintenance of the North Loup Division, Pick-Sloan Missouri Basin Program, Nebraska,
W73-04459

6E

IRRIGATION WATER

Salinity Problems in Arid Lands Irrigation: A Literature Review and Selected Bibliography,
W73-03910

3C

Agriculturally-Polluted Irrigation Water as a Source of Plant-Parasitic Nematode Infestation,
W73-03954

5B

ISOLATION

Microbiology of Water,
W73-04235

5B

Efficiency of Salmonella Isolation from Meat-and-Bone Meal of One 300-g Sample Versus Ten 30-g Samples,
W73-04247

5A

Some Observations on the Reduction of 2,3,5-Triphenyltetrazolium Chloride by Escherichia Coli,
W73-04250

5B

ISRAEL

The Spottiness of Rainfall in a Desert Area,
W73-04532

2B

ISRAEL SOILS

Steady-State Evaporation Through Non-Homogeneous Soils From a Shallow Water Table,
W73-04110

2D

ITALY

The Polluted Waters in Umbria: III. The River Nestore, (In Italian),
W73-04393

5B

JAPAN

Pesticide Regulations and Residue Problems in Japan,
W73-04042

5B

Birds Give Warning,
W73-04049

5C

Mariculture in Japan Using Heated Effluent Water,
W73-04340

5G

JUDICIAL DECISIONS

The Expansion of Federal Common Law and Federal Question Jurisdiction to Interstate Pollution,
W73-04461

5G

Bauerle v. Board of County Road Commissioners for the County of Charlevoix (All Riparian Owners Awarded Reasonable Use of Surface of Entire Lake),
W73-04470

6E

SUBJECT INDEX

LAKES

Environmental Defense Fund, Inc. V. Corps of Engineers of the United States Army (Adequacy of Environmental Impact Statement).	
W73-04471	6E
KANDAHAR (AFGHANISTAN)	
Ground Water Reconnaissance in the Arghandab River Basin Near Kandahar, Afghanistan,	
W73-04379	4B
KANSAS	
Radioactive Waste Repository Project; Annual Progress Report for Period Ending September 30, 1972,	
W73-04294	5B
KARST	
Effect of Karst on Floods on Left-Bank Tributaries of the Dniester River (Vliyanie karsta na formirovaniye livneykh pavodkov na levoberezhnykh pritokakh Dnestr'a),	
W73-04114	2E
KARST HYDROLOGY	
Effect of Karst on Floods on Left-Bank Tributaries of the Dniester River (Vliyanie karsta na formirovaniye livneykh pavodkov na levoberezhnykh pritokakh Dnestr'a),	
W73-04114	2E
Water Table Fluctuations Under Forest and Pasture in a Karstic Region of Southern Australia,	
W73-04374	2F
KARST TOPOGRAPHY	
Effect of Karst on Floods on Left-Bank Tributaries of the Dniester River (Vliyanie karsta na formirovaniye livneykh pavodkov na levoberezhnykh pritokakh Dnestr'a),	
W73-04114	2E
KATY EQUATION	
Studies on Purification Theories and Mechanism of Activated Sludge. (IV) Application of Purification Theories to the Activated Sludge Process,	
W73-03994	5D
KAZAKHSTAN	
Agrophysical Characteristics of Ordinary Chernozems in Eastern Kazakhstan, (In Russian),	
W73-03996	2G
KENTUCKY	
Comparison of Multiple Regression and Principal Component Regression for Predicting Water Yields in Kentucky,	
W73-04199	4A
KENTUCKY BLUEGRASS	
Postharvest Cultural Practices Affecting the Rooting of Kentucky Bluegrass Sods Grown on Organic and Mineral Soils,	
W73-04175	3F
KEROSENE	
Flocculant Production from Kerosene,	
W73-04245	5B
KETMEN RANGE (USSR)	
A Study of Erosion Resistance of Soils on the Northern Slopes of Trans-Ili Alatau and the Ketmen Range (In Russian),	
W73-04179	2J
KEYWORDS	
Indexed Bibliography of Thermal Effects Literature - 1,	
W73-04020	5C
KINETIC ANALYSIS	
Miniature On-Line Digital Computer for Multipurpose Applications. Applications to Kinetic Analyses,	
W73-04387	7C
KJELDAHL PROCEDURE	
An Atomic Absorption Method for Cation Measurements in Kjeldahl Digests of Biological Materials,	
W73-04251	5A
KOREA	
Propagation of Grass Carp and Silver Carp, (In Korean),	
W73-04261	8I
KRYPTON	
The Dose to Man from Atmospheric KR-85,	
W73-04291	5B
LA GUARDIA AIRPORT (N.Y.)	
Effects of Proposed Runway Extensions at Laguardia Airport on Tides, Currents, Shoaling, and Dye Dispersion,	
W73-04096	8B
LABORATORY EQUIPMENT	
Trace Metal Analysis Using Atomic Absorption Spectrophotometry,	
W73-04043	5A
Inexpensive Mercury-Specific Gas Chromatographic Detector,	
W73-04242	5A
Large, Inexpensive Oven used to Decontaminate Glassware for Environmental Pesticide Analysis,	
W73-04394	5A
LABORATORY TESTS	
Mercury in the Environment - Techniques of Analysis (XIII. Analysetechnieken voor Kwik in Het Milieu),	
W73-04046	5A
Available Water Capacity of Sandy and Gravely North Dakota Soils,	
W73-04109	2G
LAGOONS	
3-Stage Ponds Earn Plaudits,	
W73-04438	5D
LAHU (HAWAII)	
Wastewater Reclamation by Irrigation,	
W73-04480	5D
LAKE DRIVYATY	
Mathematical Model of the Ecological System of Lake Drivyaty, (In Russian),	
W73-04321	5C
LAKE ERIE	
Changes of Vascular Aquatic Flowering Plants During 70 Years in Put-In-Bay Harbor, Lake Erie, Ohio,	
W73-04258	5C
LAKE ICE	
Lake Ice Surveillance Via Airborne Radar: Some Experimental Results,	
W73-03937	7B
LAKE ICE ANALYSES	
Ice Analyses. Data From Three Norwegian Lakes,	
W73-04506	2C
LAKE ILMEN	
Production of Mass Forms of Planktonic Crustaceans in Lake Ilmen (In Russian),	
W73-04548	2H
LAKE LYNDON B. JOHNSON	
Before and After Studies on the Effects of a Power Plant Installation on Lake LBJ - A Numerical Temperature Model for Lake LBJ,	
W73-04335	5B
Before and After Studies of the Effects of a Power Plant Installation on Lake LBJ - Measurement and Prediction of Abnormal Reservoir Operations on Lake LBJ's Water Quality,	
W73-04336	5B
LAKE MAGDALENE (FLA.)	
A Hydrologic Description of Lake Magdalene Near Tampa, Florida,	
W73-04537	7C
LAKE MICHIGAN	
A Method for Calculating Water Depth, Attenuation Coefficients and Bottom Reflectance Characteristics,	
W73-03941	7B
Determination of Selected Trace Elements in Natural Water Samples Using Spark Source Mass Spectroscopy,	
W73-04304	5A
Environmental Chemistry: Grand River Studies,	
W73-04305	5B
Radiouclides in Lake Michigan Fish,	
W73-04306	5A
Depositional Patterns, Facies, and Trace Element Accumulation in the Waukegan Member of the Late Pleistocene Lake Michigan Formation in Southern Lake Michigan,	
W73-04361	2J
Assault on a Lake,	
W73-04442	5C
Use of Fallout Cesium-137 as a Tracer to Define the Recent Deltaic Facies of a River,	
W73-04501	2J
Lake Michigan Clean-Up Lagging,	
W73-04547	5D
LAKE MORPHOLOGY	
A Hydrologic Description of Lake Magdalene Near Tampa, Florida,	
W73-04537	7C
LAKE ONTARIO	
Thermal Scanner Observations over Lake Ontario,	
W73-03949	7B
LAKE ST. CROIX	
Impact of Cooling Water on Lake Temperatures,	
W73-04037	5B
LAKE WASHINGTON	
Studies of the Natural Alpha-Emitting Radioisotopes in Marine Organisms,	
W73-04320	5B
LAKES	
An Inventory of the Ponds, Lakes and Reservoirs of Massachusetts, Berkshire and Franklin Counties,	
W73-04069	2H

SUBJECT INDEX

LAKES

Bathymetric Reconnaissance of Mariette and Spooner Lakes, Washoe County and Carson City, Nevada, W73-04100	7C	LATVIAN SSR																									
Bathymetric Reconnaissance of Topaz Lake, Nevada and California, W73-04192	7C	Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava), W73-04512	2J																								
Effects of Introductions of Salmonids into Barren Lakes, W73-04406	5C	LAW OF THE SEA																									
A Hydrologic Description of Lake Magdalene Near Tampa, Florida, W73-04537	7C	Law of the Sea. W73-04465	6E																								
LAMPREYS		LEACHING																									
Lampreys and Teleost Fish, Other than Whitebait, in the Polluted Thames Estuary, W73-04262	5C	Water Use Efficiency of Vegetable Crops Grown over Asphalt Moisture Barriers, W73-03902	3F																								
LAND MANAGEMENT INFORMATION SYSTEM		A Computer Analysis on the Leaching of Boron From Stratified Soil Columns, W73-03967	2G																								
A Survey of Attitudes Towards the Mississippi River as a Total Resource in Minnesota, W73-03905	6B	Sprinkling and Ponding Techniques for Reclaiming Saline Soils, W73-04081	3F																								
LAND RECLAMATION		LEAD																									
Sprinkling and Ponding Techniques for Reclaiming Saline Soils, W73-04081	3F	Leading Question, W73-04017	5D																								
Putting Sewage Solids Back to Work, W73-04159	5D	Fallout Program Quarterly Summary Report June 1, 1972 - September 1, 1972 - An Appendix, W73-04316	5B																								
Sludge Disposal-My Problem and Its Solution: A Symposium. W73-0451	5D	LEAD RADIOISOTOPES																									
Elevation Changes Due to Tides, Long Beach, Calif., W73-04369	4B	Studies of the Natural Alpha-Emitting Radioisotopes in Marine Organisms, W73-04320	5B																								
LANDFILLS		LEAVES																									
Electrical Earth Resistivity Surveying in Landfill Investigations, W73-03918	5B	Determination of Water Stress of Eucalypts in the Field, W73-04485	2I																								
Studies of the Influence of Lagoons and Landfills on Groundwater Quality, W73-04066	5B	LEGAL ASPECTS																									
LANDSCAPING		The 92nd Congress-Good and Bad. W73-04456	6E																								
Environmental Aspects of High Voltage Substations, W73-04080	8C	LEGISLATION																									
LARGE POWER PLANT EFFLUENT STUDY (LAPPES)		The 92nd Congress-Good and Bad. W73-04456	6E																								
Large Power Plant Effluent Study (Lappes) Volume 3 - Instrumentation, Procedures, and Data Tabulations (1970), W73-04121	5A	Non-Point Source Pollution From Agricultural, Rural, and Developing Areas. W73-04462	5B																								
LASERS		LEVEES																									
Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'zovaniya laserov dlya issledovaniya dinamiki lednikovikh pohrovov), W73-04510	2C	Plaquemine Lock Closure, Mississippi River and Tributaries Project, Iberville Parish, Louisiana, Associated Water Features, Bayou Plaquemine and Gulf Intracoastal Waterway (Final Environmental Impact Statement). W73-04457	8D																								
Application of Lasers to Investigation of Glaci-er Movement (Issledovaniye dinamiki dvizheniya lednikov s pomoshch'yu lazera), W73-04518	2C	LICHENS																									
Lichenometric Indication of the Time of Exposure of a Rock Substrate, (In Russian), W73-04334	7B	Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102	5B																								
LIDAR (LASER RADAR)		LIGHTING																									
Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102	5B	A Matter of Design, W73-04030	6C																								
LIMESTONES		LOCK																									
Acid Mine Drainage Treatment Process Termed Successful. W73-03999	5D	Pertinent Data on Spillway Tainter Gates for Corps of Engineers Projects, W73-04377	8C																								
LIMNOLOGY		LOCH LOMOND																									
The Limnology and Fishes of Oligotrophic Glacial Lakes in North America (About 1800 A.D.), W73-04401	5C	Loch Lomond: Man's Effects on the Salmonid Community, W73-04407	5C																								
Limnology and Fish Ecology of Sockeye Salmon Nursery Lakes of the World, W73-04405	5C	LOCK																									
The Physicochemical Limnology of a Stretch of the Guadalupe River, Texas, With Five Main-Stream Impoundments, W73-04503	2H	Pertinent Data on Spillway Tainter Gates for Corps of Engineers Projects, W73-04377	8C																								
LINEAR PROGRAMMING		LIPIDS																									
Opportunity Costs of a Transbasin Diversion of Water 1, Methodology, W73-04276	4A	Analysis for Crude Fatty Acids (Total Fatty Acids and Unsaponifiable Matter) in Feed Grade Fats: Report of the Joint AOAC-AOCS Committee on the Analysis of Feed Grade Fats, W73-04397	5A																								
Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin, W73-04277	6D	Liquid Fertilizer																									
LIPIDS		Putting Sewage Solids Back to Work, W73-04159	5D																								
Analysis for Crude Fatty Acids (Total Fatty Acids and Unsaponifiable Matter) in Feed Grade Fats: Report of the Joint AOAC-AOCS Committee on the Analysis of Feed Grade Fats, W73-04397	5A	Liquid Liquid Chromatography																									
Rapid Separation of Metal Chelates by Column Liquid-Liquid Chromatography using Ultraviolet Detection, W73-04391	5A	Liquid Wastes		Liquid Liquid Chromatography		Recovers Salable Products from Waste Yeast, W73-04014	5D	Liquid and Sludge Treatment, W73-04143	5D	Treating Liquid Waste Effluent, W73-04150	5D	Backflushing Filter, W73-04151	5D	Inline Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment, W73-04161	5D	LITHUANIA		Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniyu moreiskikh beregov. 13-21 sentyabrya 1971 g. Palanga-Nida. Tezisy dokladov), W73-04514	2J	LOCH LOMOND		Loch Lomond: Man's Effects on the Salmonid Community, W73-04407	5C	LOCKS		Pertinent Data on Spillway Tainter Gates for Corps of Engineers Projects, W73-04377	8C
Liquid Wastes		Liquid Liquid Chromatography																									
Recovers Salable Products from Waste Yeast, W73-04014	5D	Liquid and Sludge Treatment, W73-04143	5D	Treating Liquid Waste Effluent, W73-04150	5D	Backflushing Filter, W73-04151	5D	Inline Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment, W73-04161	5D	LITHUANIA		Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniyu moreiskikh beregov. 13-21 sentyabrya 1971 g. Palanga-Nida. Tezisy dokladov), W73-04514	2J	LOCH LOMOND		Loch Lomond: Man's Effects on the Salmonid Community, W73-04407	5C	LOCKS		Pertinent Data on Spillway Tainter Gates for Corps of Engineers Projects, W73-04377	8C						
Liquid and Sludge Treatment, W73-04143	5D																										
Treating Liquid Waste Effluent, W73-04150	5D	Backflushing Filter, W73-04151	5D	Inline Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment, W73-04161	5D	LITHUANIA		Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniyu moreiskikh beregov. 13-21 sentyabrya 1971 g. Palanga-Nida. Tezisy dokladov), W73-04514	2J	LOCH LOMOND		Loch Lomond: Man's Effects on the Salmonid Community, W73-04407	5C	LOCKS		Pertinent Data on Spillway Tainter Gates for Corps of Engineers Projects, W73-04377	8C										
Backflushing Filter, W73-04151	5D																										
Inline Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment, W73-04161	5D																										
LITHUANIA																											
Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniyu moreiskikh beregov. 13-21 sentyabrya 1971 g. Palanga-Nida. Tezisy dokladov), W73-04514	2J																										
LOCH LOMOND																											
Loch Lomond: Man's Effects on the Salmonid Community, W73-04407	5C																										
LOCKS																											
Pertinent Data on Spillway Tainter Gates for Corps of Engineers Projects, W73-04377	8C																										

SUBJECT INDEX

MATHEMATICAL MODELS

LONG BEACH (CALIF)		MANGANESE	
Elevation Changes Due to Tides, Long Beach, Calif., W73-04369	4B	Effect of the Soil Moisture Content on the Mobility of Iron and Manganese (In Russian), W73-04251	2G
LONGITUDINAL MIXING		Evaluation of Treatment Plants by Tracer Methods. Annual Report, Jan. 1971-Jan. 1972, W73-04297	5B
Predicting Effects of Dead Zones on Stream Mixing, W73-04288	5B	Stream Faunal Recovery After Manganese Strip Mine Reclamation, W73-04546	5C
LOS ANGELES		MANGANESE SULFATE TREATMENTS	
Waste Water Reuse-A Supplemental Supply, W73-03987	5D	Effects of Irrigation, Manganese Sulphate and Sulphur Applications on Common Scab of the Potato, W73-04167	5G
LOUISIANA		Common Potato Scab: Effects of Irrigation, Manganese Sulphate and Sulphur Treatments for Common Potato Scab on Mineral Composition of Plant Material and Soil Extracts, W73-04168	5G
Plaquemine Lock Closure, Mississippi River and Tributaries Project, Iberville Parish, Louisiana, Associated Water Features, Bayou Plaquemine and Gulf Intracoastal Waterway (Final Environmental Impact Statement), W73-04457	8D	MANGROVE SWAMPS	
Ground Water in the Plaquemine-White Castle Area, Iberville Parish, Louisiana, W73-04502	4B	Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico, W73-04241	5C
Water Resources of Union Parish, Louisiana, W73-04503	4B	MANGROVES-D	
Water Resources of Ouachita Parish, Louisiana, W73-04504	4B	Our Mangroves Threatened, W73-04263	2I
LOW FLOW		MAPPING	
Minimum Streamflow in Northwest Ukraine (Osobennosti formirovaniya minimal'nogo stoka rek Severo-Zapada Ukrayiny), W73-04118	2E	Nebraska Droughts: A Study of their Past Chronological and Spatial Extent with Implications for the Future, W73-03907	2B
MACROINVERTEBRATES		Determination of Sea Ice Drift Using Side-Looking Airborne Radar, W73-03951	7B
Water Pollution. Freshwater Macroinvertebrates, W73-04238	5C	MARINA DEL REY (CALIF)	
MAGNESIUM		Marina Del Rey: A Study of Environmental Variables in a Semi-Enclosed Coastal Water, W73-04197	5B
The Concentration of K, Ca, and Mg in the Saturation Extract in Relation to Exchangeable K, Ca, and Mg, W73-03970	2K	MARINE ALGAE	
MAGNETIC STUDIES		Losses of 65 ZN To Inorganic Surfaces in a Marine Algal Nutrient Medium, W73-04011	5C
Paleomagnetic Studies of Bottom Sediments from the Indian Ocean Area of the Antarctic (Paleomagnitnyye issledovaniya donnykh otodzhenny Indiyskogo sektora Antarktiki), W73-04516	2J	Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico, W73-04241	5C
MAIZE-M		MARINE ANIMALS	
Photosynthetic Response to Drought in Maize, W73-04260	3F	Ecological Studies of Radioactivity in the Columbia River Estuary and Adjacent Pacific Ocean, Progress Report, July 1, 1971-June 30, 1972, W73-04299	5B
Effect of Irrigation, Fertilization and Plowing Depth on Quantity of White Wheat and Maize, W73-04267	3F	MARINE BIOLOGY	
MALAYSIA		Marine Life in the Morro Bay Power Plant Discharge Canal, W73-04031	5C
A Shellfish-Borne Cholera Outbreak in Malaysia, W73-04182	5C	Activation Analysis Trace-Element Studies for Marine Biological Samples, W73-04327	5A
MANAGEMENT		MARINE FISH	
A Study of Water Institutions of Hawaii, W73-04062	6B	Mercury in Fish - Total Content in Freshwater and Marine Fishes (VII. (Totaal) Kwikgehalte van Zoetwateren Zeevis), W73-04044	5C
Preventive Maintenance and Operational Know-How Improve Waste Treatment Systems, W73-04278	5D		

Seasonal Concentration, Turnover, and Mode of Accumulation of p32 by the Juvenile Starry Flounder in the Columbia River Estuary, *Platichthys Stellatus* (Pallas), W73-04322

5C

MARINE RESOURCES

A Study of the Marine Resources of Dorchester Bay, W73-04189

6C

MARKING TECHNIQUES

Sources of Water Pollution Established by Using a Neutron Activatable Tracer, W73-04326

5B

MARLETTE LAKE (NEV)

Bathymetric Reconnaissance of Marlette and Spooner Lakes, Washoe County and Carson City, Nevada, W73-04100

7C

MARSHES

Geological and Archaeological Investigation of the Mode of Origin of the Marshes in Nordfriesland (Germany), (In German), W73-04229

2L

MASS SPECTROMETRY

Determination of Selected Trace Elements in Natural Water Samples Using Spark Source Mass Spectroscopy, W73-04304

5A

MASS SPECTROSCOPY

Chromatographic Detection of Water Contaminants, W73-04423

5A

MASS TRANSFER

Solutions for Miscible Displacement of Soil Water with Time-Dependent Velocity and Dispersion Coefficients, W73-04090

2G

Wave Effect and Eddy Diffusivity in the Air near a Water Surface, W73-04209

2E

MASSACHUSETTS

An Inventory of the Ponds, Lakes and Reservoirs of Massachusetts, Berkshire and Franklin Counties, W73-04069

2H

A Study of the Marine Resources of Dorchester Bay, W73-04189

6C

Direct Filtration an Economic Answer to Water Treatment Needs, W73-04446

5D

Conference in the Matter of Pollution of the Interstate Waters of the Merrimack and Nashua Rivers and Their Tributaries, Massachusetts-New Hampshire and the Intrastate Portions of Those Waters Within the State of Massachusetts, W73-04469

5G

MATHEMATICAL MODELS

Flood Forecasting in the Upper Midwest - Data Assembly and Preliminary Analysis, W73-03906

4A

Finite-Difference Convection Errors, W73-03997

2E

Cooling Tower Plume Rise and Condensation, W73-04025

5D

SUBJECT INDEX

MATHEMATICAL MODELS

Optimal Pricing Policies for Conjunctive Urban Water Supply and Waste Water Treatment Systems, W73-04060	5G	Analysis of Turbidite Correlation in Cascadia Basin, Northeast Pacific Ocean, W73-04249	5B	Reverse Osmosis Can Cut Cost of Water Treatment, W73-04549	5D
Line Source Distributions in Two Dimensions: Applications to Water Quality, W73-04201	5B	Nonuniform Groundwater-Conduit Discharge and Head Loss, W73-04362	2F	MENHADEN An Electronic Detector System for Recovering Internally Tagged Menhaden, Genus Brevoortia, W73-04174	7B
Stability and the Conservation of Mass in Drainage Basin Evolution, W73-04202	2A	Performance of Deep Trickling Filters by Five Methods, W73-04486	5D	MERCURY Pesticide Regulations and Residue Problems in Japan, W73-04042	5B
Wind-Induced and Thermally Induced Currents in the Great Lakes, W73-04208	2H	MEANDERS Longitudinal Dispersion in Sinuous Channels, W73-04214	5B	Mercury in Fish - Total Content in Freshwater and Marine Fishes (VII. (Totaal) Kwikgehalte van Zoetwateren Zeevis), W73-04044	5C
Computer Model of Vortex Shedding from a Cylinder, W73-04216	8B	Estimating Discharge from Superelevation in Bends, W73-04219	8B	Mercury in Fish - Imported Tinned Fish, (IX. Kwikgehalten van een Aantal Sorten Ingeklante Vis), W73-04045	5C
Predicting Effects of Dead Zones on Stream Mixing, W73-04288	5B	MEASUREMENT Measurement of Unsaturated Conductivity and Diffusivity by Infiltration Through an Impeding Layer, W73-03971	2G	Mercury in the Environment - Techniques of Analysis (XIII. Analysetechnieken voor Kwik in Het Milieu), W73-04046	5A
Mathematical Model of the Ecological System of Lake Drivaty, (In Russian)., W73-04321	5C	Shallow-Water Strontium-90 Anomaly About the Antilles Arc-1970, W73-04293	5B	Legacy of the Mad Hatter, W73-04048	5C
Before and After Studies on the Effects of a Power Plant Installation on Lake LBJ - A Numerical Temperature Model for Lake LBJ, W73-04335	5B	Radiological Surveillance at Pressurized Water Reactors, W73-04325	5B	Birds Give Warning, W73-04049	5C
Properties of the Kernels for Time Invariant, Initially Relaxed, Second Order, Surface Runoff Systems, W73-04371	2A	Literature Search for Atmospheric Humidity Profile Models from the Sea Surface to 1,000 Meters, W73-04332	7C	Sources of Error and Confirmation in the Determination of Methylmercury Radicals, W73-04050	5A
Some Single- and Multi-Site Models of Rainfall Within Discrete Time Increments, W73-04372	2B	Application of Lasers to Investigation of Glaci-er Movement (Issledovaniye dinamiki dvizheniya lednikov s pomoshch'yu lazera), W73-04518	2C	Activation Analysis of Mercury and Other Environmental Pollutants in Water and Aquatic Ecosystems, W73-04051	5A
The Infiltration Envelope: Results From a Theoretical Infiltrometer, W73-04376	2G	MECHANICAL PRESSURE Topsoil Reaction to Mechanical Pressure, W73-04057	2G	A Physicochemical Rationale for the Biological Activity of Mercury and Its Compounds, W73-04054	5C
Interception of Rain by Forest Vegetation-Estimation of Daily Interception Using a Mathematical Model (Interception de la pluie par la vegetation forestiere-estimation de l'interception journaliere a l'aide d'un modele mathematique), W73-04530	2A	MEDICINE A Physicochemical Rationale for the Biological Activity of Mercury and Its Compounds, W73-04054	5C	Mercury Pollution, W73-04055	5B
MATHEMATICAL STUDIES		MEKONG RIVER Some Generalized Characteristics of the Floods and Droughts of the Lower Mekong, W73-04380	2E	Mercury Concentration in Recent and Ninety-Year-Old Benthopelagic Fish, W73-04122	5B
Studies on Purification Theories and Mechanism of Activated Sludge. (III) Similarity in Adsorption Mechanism of Activated Sludge and Charcoal, W73-03993	5D	MELT WATER Water Pressure in Intra- and Subglacial Channels, W73-03927	2C	Mercury Detection by Means of Thin Gold Films, W73-04123	5A
Studies on Purification Theories and Mechanism of Activated Sludge. (IV) Application of Purification Theories to the Activated Sludge Process, W73-03994	5D	Movement of Water in Glaciers, W73-03936	2C	On the State of Mercury (II) Traces in Aqueous Solutions - Colloidal Behavior of Mercury, W73-04126	5A
Amplification Criterion of Gradually Varied, Single Peaked Waves, W73-04097	8B	MEMBRANE FILTERS Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters, W73-04390	5F	Methylmercury, A Review of Health Hazards and Side Effects Associated with the Emission of Mercury into Natural Systems, W73-04127	5C
Theory of Water Movement in Soils: 4. Two and Three Dimensional Steady Infiltration, W73-04106	2G	MEMBRANE PROCESSES Reverse Osmosis Can Cut Cost of Water Treatment, W73-04549	5D	Inexpensive Mercury-Specific Gas Chromatographic Detector, W73-04242	5A
Theory of Water Movement in Soils: 5. Unsteady Infiltration From Spherical Cavities, W73-04225	2G	MEMBRANES Reverse Osmosis Water Purifier, W73-04135	3A	Activation Analysis Trace-Element Studies for Marine Biological Samples, W73-04327	5A
Computer-Aided Visual Spectrum Analysis, W73-04234	5A			MERCURY DETECTOR Inexpensive Mercury-Specific Gas Chromatographic Detector, W73-04242	5A

SUBJECT INDEX

MODEL STUDIES

METABOLISM			
A Temperature-Induced Transition in Mitochondrial Oxidation: Contrasts Between Cold and Warm-Blooded Animals, W73-04027	5C	Birds Give Warning, W73-04049	5C
Study of the Metabolization of Pollutant Products, W73-04402	5B	Sources of Error and Confirmation in the Determination of Methylmercury Radicals, W73-04050	5A
METABOLITES		Methylmercury, A Review of Health Hazards and Side Effects Associated with the Emission of Mercury into Natural Systems, W73-04127	5C
Study of the Metabolization of Pollutant Products, W73-04402	5B	MEXICO	
METAL CHELATES		Conquest of Wastes Show Productivity, W73-03979	3F
Rapid Separation of Metal Chelates by Column Liquid-Liquid Chromatography using Ultraviolet Detection, W73-04391	5A	MICHAELIS-MENTON EQUATION	
Titrimetric Microdetermination of Zinc With EDTA Using 1,5-Di-Beta-Naphthylthiocarbazone (HNDZ) as an Extractive Indicator, W73-04231	5A	Studies on Purification Theories and Mechanism of Activated Sludge. (III) Similarity in Adsorption Mechanism of Activated Sludge and Charcoal, W73-03993	5D
A High-Selective Titration Method for Determining Copper with 2,2-Bicinchoninic Acid (In Russian), W73-04248	5A	MICHIGAN	
METALS		The Uptake of Insecticides by Freshwater Mussels and the Effects of Sublethal Concentrations of Insecticides on These Mussels, W73-03904	5C
Waste Acid to be Recovered and Refused, W73-04015	5D	Incidence of Prosthecate Bacteria in a Polluted Stream, W73-04265	5B
METEORIC WATER		Bauerle V. Board of County Road Commissioners for the County of Charlevoix (All Riparian Owners Accorded Reasonable Use of Surface of Entire Lake), W73-04470	6E
Chemical Composition of Atmospheric Precipitation in the Deputatskiy Region (Khimicheskiy sostav atmosfernykh osadkov, vypadayushchikh na territorii Deputatskogo rayona), W73-04511	2B	MICROBIAL DEGRADATION	
METEOROLOGICAL DATA		Effects of Various Soil Fungi and Insecticides on the Capacity of <i>Mucor alternans</i> to Degrade DDT, W73-04232	5B
The Possibility of Objective Control of Soil Moisture Data (In Russian), W73-04180	2G	Study of the Metabolization of Pollutant Products, W73-04402	5B
METHODOLOGY		MICRONUTRIENTS	
Radioactive Wastes, W73-04239	5B	Isotopic Exchange Studies of Micronutrients in Soils, W73-03963	2G
An Atomic Absorption Method for Cation Measurements in Kjeldahl Digests of Biological Materials, W73-04251	5A	MICROORGANISMS	
Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters, W73-04390	5F	Microbes as Tracers of Water Movement, W73-04392	5B
Algal Assay Procedure, W73-04404	5A	MICROWAVE EMISSION FROM SNOW	
Mercury in Fish - Imported Tinned Fish, (IX. Kwikgehalten van een Aantal Sorten Ingeblikte Vis), W73-04045	5C	Microwave Emission From Snow--A Progress Report, W73-03950	7B
Mercury in the Environment - Techniques of Analysis (XIII. Analysetechnieken voor Kwik in Het Milieu), W73-04046	5A	MICROWAVES	
METHYL MERCURY		Microwave Emission From Snow--A Progress Report, W73-03950	7B
Legacy of the Mad Hatter, W73-04048	5C	MINERAL SOILS	
		Postharvest Cultural Practices Affecting the Rooting of Kentucky Bluegrass Sods Grown on Organic and Mineral Soils, W73-04175	3F
		MINERALOGY	
		Recent Sediments of the Central California Continental Shelf, Pigeon Point to Sand Hills Bluffs: Part B. Mineralogical Data, W73-03922	2J
		Iron and Silica in Water, Acid Ammonium Oxalate, and Dithionite Extracts of Some North Carolina Coastal Plain Soils, W73-04088	2G
		MINIMIZATION PROCEDURES	
		Selection of Test Variable for Minimal Time Detection of Basin Response to Natural or Induced Changes, W73-04061	4A
		MINNESOTA	
		A Survey of Attitudes Towards the Mississippi River as a Total Resource in Minnesota, W73-03905	6B
		Frio River, Three Rivers, Texas; Mississippi River at Winona, Minnesota; Survey Resolutions, W73-04463	6G
		MISSISSIPPI RIVER	
		A Survey of Attitudes Towards the Mississippi River as a Total Resource in Minnesota, W73-03905	6B
		Frio River, Three Rivers, Texas; Mississippi River at Winona, Minnesota; Survey Resolutions, W73-04463	6G
		MISSISSIPPI RIVER BASIN	
		Environmental Defense Fund, Inc. V. Corps of Engineers of the United States Army (Adequacy of Environmental Impact Statement), W73-04471	6E
		MISSOURI RIVER	
		Statistical Properties of Missouri River Bed Forms, W73-04365	8B
		MITOCHONDRIAL OXIDATION	
		A Temperature-Induced Transition in Mitochondrial Oxidation: Contrasts Between Cold and Warm-Blooded Animals, W73-04027	5C
		MIXING	
		Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102	5B
		Predicting Effects of Dead Zones on Stream Mixing, W73-04288	5B
		Shallow-Water Strontium-90 Anomaly About the Antilles Arc-1970, W73-04293	5B
		MIXING-HEIGHT MEASUREMENT	
		Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102	5B
		MODEL STUDIES	
		Rheology of Friction-Reducing Polymer Solutions, W73-03913	8B
		Model Studies of Navigation Improvements, Columbia River Estuary: Report 2, Section 3, Fixed-Bed Studies of Disposal Areas C and D, W73-03915	8B
		Sensitivity of Groundwater Flow Models to Vertical Variability of Aquifer Constants, W73-04065	2F

SUBJECT INDEX

MODEL STUDIES

A Dynamic Programming Study of Various Diversion Losses, W73-04068	4A	MOSSES Growth Form and Water Relations of Mosses in the Maritime Antarctic, W73-04259	2C	mavium-M. Intracellulare-M. Scrofulaceum Complex, W73-04398	5A
Effects of Proposed Runway Extensions at Laguardia Airport on Tides, Currents, Shoaling, and Dye Dispersion, W73-04096	8B	MOVEMENT Survey of the Rusty Glacier Area, Yukon Territory, Canada, 1967-70, W73-03932	2C	MYCOTOXINS Toxic Effects of the Mycotoxins Aflatoxin B1, Rubratoxin B, Patulin, and Diacetoxyscirpenol on the Crustacean Cyclops fuscus, W73-04395	5C
Strontrium-90 in the Great Lakes: Concentration-Time Model, W73-04296	5A	A Model of a Surging Glacier, W73-03933	2C	MYXOBACTERIA Differences of Bacterial Groups of Nutrient Media in the Determination of Germ Groups in Water (In German), W73-04257	5A
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part I - Technical Aspects, W73-04542	2A	The Morphological Effects of Surges of the Donjek Glacier, St Elias Mountains, Yukon Territory, Canada, W73-03934	2C	NANNOPLANKTON Studies of the Natural Alpha-Emitting Radioisotopes in Marine Organisms, W73-04320	5B
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part II - The Computer Program, W73-04543	2A	Periodic Surge Origin of Folded Medial Moraines on Bering Piedmont Glacier, Alaska, W73-03935	2C	NARRAGANSETT BAY Bacterial Reduction of Arsenate in Sea Water, W73-04479	5B
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part III - User's Manual, W73-04544	2A	Application of Lasers to Investigation of Glacier Movement (Issledovaniye dinamiki dvizheniya lednikov s pomoshch'yu lazera), W73-04518	2C	NATIONAL ENVIRONMENTAL POLICY ACT Environmental Defense Fund, Inc. v. Corps of Engineers of the United States Army (Adequacy of Environmental Impact Statement), W73-04471	6E
Effects of Elevated Temperature of Juvenile Coho Salmon and Benthic Invertebrates in Model Stream Communities, W73-04545	5C	MUCOR ALTERNANS Effects of Various Soil Fungi and Insecticides on the Capacity of Mucor alternans to Degrade DDT, W73-04232	5B	NATIONAL SHORELINE STUDY Regional Inventory Report-South Atlantic-Gulf Region, Puerto Rico and the Virgin Islands, W73-04228	8B
MOISTURE CONTENT		MUDFLOWS Particle Size of Mudflows on Carpathian Rivers in the Ukraine (Granulometricheskiy sostav selevykh otlozhennyi na rekakh Ukrainskikh Karpat), W73-04119	2E	NATIONAL DRAINAGE BOUNDARIES A New Topological Relationship as an Indicator of Drainage Network Evolution, W73-04203	4A
Electromagnetic Pulse Sounding for Surveying Underground Water, W73-03912	7B	MULTIPLE-PURPOSE PROJECTS East Fork of Whitewater River, Indiana and Ohio (Final Environmental Impact Statement), W73-04458	8A	NATURAL FILTRATION Putting Sewage Solids Back to Work, W73-04159	5D
MOLDAVIA		Savannah River Basin Inspection, W73-04472	6E	NATURAL RESOURCES Energy Resources of the United States, W73-04039	6G
Investigation and Calculation of Components in the Hydrologic Regime of Rivers (Issledovaniya i raschetы elementov gidrologicheskogo rezhima rek). W73-04111	2E	MULTIPURPOSE RESERVOIRS Opportunity Costs of a Transbasin Diversion of Water 1. Methodology, W73-04276	4A	NAVIGATION Model Studies of Navigation Improvements, Columbia River Estuary: Report 2, Section 3, Fixed-Bed Studies of Disposal Areas C and D, W73-03915	8B
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego polovod'ya malykh vodotokov Ukrayiny i Moldavii), W73-04116	2E	MUNICIPAL WASTES Tertiary Filtering Arrangement, W73-04144	5D	Utilization of Deep Water Heat in Reservoirs for the Maintenance of Unfrozen Water Areas, W73-04034	2C
MOLLUSKS		Effluent Standards as Proposed by the Royal Commission on Sewage Disposal, W73-04491	5G	Murrells Inlet, South Carolina: Northport Harbor, Wisconsin. W73-04453	6E
Microbiology of Water, W73-04235	5B	MUSSELS The Uptake of Insecticides by Freshwater Mussels and the Effects of Sublethal Concentrations of Insecticides on These Mussels, W73-03904	5C	NEBRASKA Nebraska Droughts: A Study of their Past Chronological and Spatial Extent with Implications for the Future, W73-03907	2B
MONITORING		MUTAGENICITY Evaluation of Herbicides for Possible Mutagenic Properties, W73-04233	5C	To Authorize Construction, Operation and Maintenance of the North Loup Division, Pick-Sloan Missouri Basin Program, Nebraska. W73-04459	6E
Remote Sensing Considerations for Water Quality Monitoring, W73-03947	5B	MUTANTS Evaluation of Herbicides for Possible Mutagenic Properties, W73-04233	5C	NEMATODES Agriculturally-Polluted Irrigation Water as a Source of Plant-Parasitic Nematode Infestation, W73-03954	5B
An Investigation into the Determination of Plutonium in Soil by a Fusion Procedure, W73-04295	5B	MYCOBACTERIUM Modification of Schaefer's Procedure for Serotyping of Organisms of the Mycobacteriu-			
Fallout Program. Quarterly Summary Report, June 1, 1972 Through Sept. 1, 1972, W73-04315	5B				
Radiological Surveillance at Pressurized Water Reactors, W73-04325	5B				
Effluent Standards and the Assessment of the Effects of Pollution on Rivers, W73-04494	5G				
MORRO BAY POWER PLANT					
Marine Life in the Morro Bay Power Plant Discharge Canal, W73-04031	5C				

SUBJECT INDEX

NUCLEAR EXPLOSIONS

NETWORKS		
Spatial Analysis of Rainfall Data from Dense Networks, W73-04383	7C	
NEUSE RIVER (NC)		
Streamflow Routing (With Applications to North Carolina Rivers), W73-03908	4A	
NEUTRON ACTIVATION ANALYSIS		
Mercury in the Environment - Techniques of Analysis (XIII. Analysetechniken voor Kwik in Het Milieu), W73-04046	5A	
Activation Analysis of Mercury and Other Environmental Pollutants in Water and Aquatic Ecosystems, W73-04051	5A	
Activation Analysis Trace-Element Studies to Marine Biological Samples, W73-04327	5A	
Nuclear Activation Analysis of Se, As, Zn, Cd, and Hg in Environmental Matrices, W73-04328	5A	
Activation analysis of Heavy Metals in Surface Waters Using Ion Exchange Filter Paper and Cyanide Complexing, W73-04329	5A	
Measurements of Movements of Solid Substances in Water by Means of Stable Tracers and Activation Analysis, W73-04490	5B	
NEVADA		
Bathymetric Reconnaissance of Mariette and Spooner Lakes, Washoe County and Carson City, Nevada, W73-04100	7C	
Bathymetric Reconnaissance of Topaz Lake, Nevada and California, W73-04192	7C	
Bathymetric Reconnaissance of Rye Patch Reservoir and the Pitt-Taylor Reservoirs, Pershing County, Nevada, W73-04227	7C	
Water Supply for the Nuclear Rocket Development Station at the U.S. Atomic Energy Commission's Nevada Test Site, W73-04370	4B	
NEW HAMPSHIRE		
Conference in the Matter of Pollution of the Interstate Waters of the Merrimack and Nashua Rivers and Their Tributaries, Massachusetts-New Hampshire and the Intrastate Portions of Those Waters Within the State of Massachusetts. W73-04469	5G	
NEW MEXICO		
Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin, W73-04277	6D	
NEW YORK		
Effects of Proposed Runway Extensions at Laguardia Airport on Tides, Currents, Shoaling, and Dye Dispersion, W73-04096	8B	
Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant,	SA	
W73-04311		
Trends of Power Generation and Thermal Discharges in New York State,	SG	
W73-04338		
Problems and Opportunities in Waste Heat Disposal,	SG	
W73-04347		
NITRATES		
Water Use Efficiency of Vegetable Crops Grown over Asphalt Moisture Barriers, W73-03902	3F	
Brucine Analysis for High Nitrate Concentrations,	SA	
W73-04000		
Studies of Nitrogen Compounds in Waters: I. Separate of Nitrate and Nitrite Nitrogen in Waste Waters (In Japanese),	SD	
W73-04188		
NITRILOTRACETIC ACID		
Quantitative Determination of Nitrilotriacetic Acid and Related Aminopolycarboxylic Acids in Inland Waters: Analysis by Gas Chromatography, W73-04183	5A	
NITRITE NITROGEN		
Studies of Nitrogen Compounds in Waters: I. Separate of Nitrate and Nitrite Nitrogen in Waste Waters (In Japanese), W73-04188	SD	
NITROGEN		
Forms of Nitrogen in the Volcanic Soils of Sibundoy (In Spanish), W73-04032	5B	
N Sub 2-Threat to Pacific Northwest Fisheries,	SI	
W73-04075		
Effect of Nitrogen Source on Corn and Bromegrass Production, Soil pH, and Inorganic Soil Nitrogen,	3F	
W73-04173		
The Eutrophication Problem,	SC	
W73-04403		
Nitrogen and Phosphorus Dynamics in Three Central Texas Impoundments,	SC	
W73-04484		
NOISE REDUCTION		
Environmental Aspects of High Voltage Substations, W73-04080	8C	
NOISE (SOUND)		
An Analysis of Transmission Line Audible Noise Levels Based Upon Field and Three-Phase Test Line Measurements, W73-04085	8C	
NON-POINT SOURCES (POLLUTION)		
Non-Point Source Pollution From Agricultural, Rural, and Developing Areas. W73-04462	5B	
NON-UNIFORM FLOW		
Nonuniform Groundwater-Conduit Discharge and Head Loss, W73-04362	2F	
NORDFRIESLAND (GERMANY)		
Geological and Archaeological Investigation of the Mode of Origin of the Marshes in Nordfriesland (Germany), (In German), W73-04229	2L	
NORTH AMERICA		
Energy Resources of the United States, W73-04039	6G	
NORTH CAROLINA		
Streamflow Routing (With Applications to North Carolina Rivers), W73-03908	4A	
Regional Development of Public Water Supply Systems, W73-04054	3D	
Predicting Soil Moisture in the Southern Appalachians, W73-04086	2G	
Iron and Silica in Water, Acid Ammonium Oxalate, and Dithionite Extracts of Some North Carolina Coastal Plain Soils, W73-04088	2G	
Rainfall and Runoff in Urban Areas-A Case Study of Flooding in the Piedmont of North Carolina, W73-04356	4C	
NORTH DAKOTA SOILS		
Available Water Capacity of Sandy and Gravelly North Dakota Soils, W73-04109	2G	
NORWAY		
Ice Analyses. Data From Three Norwegian Lakes, W73-04506	2C	
NUCLEAR ENERGY		
Energy Resources of the United States, W73-04039	6G	
NUCLEAR ENGINEERING		
Observations of Radioruthenium and Radiocerium Isotopic Activity Ratios in Rain Water, W73-04313	5A	
Bioenvironmental Safety Studies, Amchitka Island, Alaska. Cannikin D + 2 Months Report, W73-04317	SC	
NUCLEAR EXPLOSIONS		
Water Inflow into Hole UA-1, Amchitka Island, Alaska, W73-03919	5A	
Radiocarbon in the Sea, W73-04292	5B	
Stable Element Concentrations and Estimations of the Radionuclide Contents in the Fish and Invertebrates Sampled from the Waters Adjacent to Panama and Columbia, W73-04307	SC	
Observations of Radioruthenium and Radiocerium Isotopic Activity Ratios in Rain Water, W73-04313	5A	
NUCLEAR EXPLOSIONS		
Bioenvironmental Safety Studies, Amchitka Island, Alaska. Cannikin D + 2 Months Report, W73-04317	SC	

SUBJECT INDEX

NUCLEAR POWER PLANTS

NUCLEAR POWER PLANTS
A Method for Minimizing Effects of Waste Heat Discharges,
W73-04481 5G

NUCLEAR POWERPLANTS
Siting A Thermal Multi-Purpose Energy Center,
W73-04021 5C

The Four Big Fears About Nuclear Power,
W73-04022 5C

The Nuclear Plant Controversy - II: Power and Hot Water,
W73-04023 5C

Radioactive Waste Repository Project; Annual Progress Report for Period Ending September 30, 1972,
W73-04294 5B

Environmental Surveillance at Hanford for CY-1971,
W73-04310 5A

Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant,
W73-04311 5A

Outcry Over Exposure Guidelines,
W73-04314 5G

Radiological Surveillance at Pressurized Water Reactors,
W73-04325 5B

NUCLEAR REACTORS

Water Supply for the Nuclear Rocket Development Station at the U.S. Atomic Energy Commission's Nevada Test Site,
W73-04370 4B

NUCLEAR SAFETY INFORMATION CENTER
Indexed Bibliography of Thermal Effects Literature - 1,
W73-04020 5C

NUCLEAR WASTES
The Four Big Fears About Nuclear Power,
W73-04022 5C

Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report,
W73-04290 5B

The Dose to Man from Atmospheric KR-85,
W73-04291 5B

Radioactive Waste Repository Project; Annual Progress Report for Period Ending September 30, 1972,
W73-04294 5B

An Investigation into the Determination of Plutonium in Soil by a Fusion Procedure,
W73-04295 5B

Radioecology and Ecophysiology of Desert Plants at the Nevada Test Site,
W73-04300 5C

Radiionuclides in Lake Michigan Fish,
W73-04306 5A

Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant,
W73-04311 5A

Radioactive Wastes,
W73-04312 5D

Outcry Over Exposure Guidelines,
W73-04314 5G

NUMERICAL ANALYSIS

Numerical Modeling of the Growth of Ice Crystals, Graupel, and Hail,
W73-04104 2C

Exact Nonlinear Model of Wave Generator,
W73-04220 2E

NUTRIENT BALANCE

Nutritional and Water Requirements of Buckwheat,
W73-04268 3F

NUTRIENT BUDGET

Nitrogen and Phosphorus Dynamics in Three Central Texas Impoundments,
W73-04484 5C

NUTRIENT TRAPS

Nitrogen and Phosphorus Dynamics in Three Central Texas Impoundments,
W73-04484 5C

NUTRIENTS

Ecological Factors Influencing Production of Algae in Northern Prairie Lakes,
W73-03909 5C

The Eutrophication Problem,
W73-04403 5C

Limnology and Fish Ecology of Sockeye Salmon Nursery Lakes of the World,
W73-04405 5C

OACHITA PARISH (LA)

Water Resources of Ouachita Parish, Louisiana,
W73-04504 4B

OAK CREEK (WIS)

Dry Graphite Film Protects Treatment Plant Units,
W73-04444 8G

OATS-M

Soil Moisture Pressure and Relative Transpiration of Plants in the Case of Soil Drought (In Russian),
W73-04524 2D

OCEAN CIRCULATION

Relationship Between Circulation and Structure of Waters of the Indian Ocean (O vzaimosvyazi tsirkulyatsii i struktury vod Indiyskogo okeana),
W73-04515 2E

OCEAN CURRENTS

Sea Surface Temperature Mapping off the Eastern United States Using NASA's Iros Satellite,
W73-03942 7B

Coastal Currents of Pacific Northwest,
W73-04364 5B

Relationship Between Circulation and Structure of Waters of the Indian Ocean (O vzaimosvyazi tsirkulyatsii i struktury vod Indiyskogo okeana),
W73-04515 2E

OCEAN DUMPING

The Oceans Have Become the Sinks of the World,
W73-03989 5C

OCEAN WAVES

Forces Exerted by Waves Breaking Seaward of a Vertical Seawall,
W73-03925 8B

Energy Spectra of Sea Waves from Photographic Interpretation,
W73-03939 7B

OCEANOGRAPHY

Red Sea Drillings,
W73-04193 2J

Relationship Between Circulation and Structure of Waters of the Indian Ocean (O vzaimosvyazi tsirkulyatsii i struktury vod Indiyskogo okeana),
W73-04515 2E

Paleomagnetic Studies of Bottom Sediments from the Indian Ocean Area of the Antarctic (Paleomagnitnye issledovaniya donnykh otlozhennyi Indiyskogo sektora Antarktiki),
W73-04516 2J

OCEANS

The Oceans Have Become the Sinks of the World,
W73-03989 5C

Mercury Concentration in Recent and Ninety-Year-Old Benthopelagic Fish,
W73-04122 5B

The Instability of Ocean Populations,
W73-04240 5C

Radiocarbon in the Sea,
W73-04292 5B

Concentration of C-14 in the Troposphere During 1953 to 1971, (In Russian),
W73-04323 5A

Measurements of Sea Surface Temperature on the Eastern Pacific Continental Shelf Using Airborne Infrared Radiometry, August 1968 - July 1968,
W73-04352 7B

Law of the Sea.
W73-04465 6E

ODOR

Dehydrated Poultry Waste in Poultry Rations,
W73-03992 5E

Inline Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment,
W73-04161 5D

OGALLALA AQUIFER

Sensitivity of Groundwater Flow Models to Vertical Variability of Aquifer Constants,
W73-04065 2F

OHIO

Changes of Vascular Aquatic Flowering Plants During 70 Years in Put-In-Bay Harbor, Lake Erie, Ohio,
W73-04258 5C

East Fork of Whitewater River, Indiana and Ohio (Final Environmental Impact Statement),
W73-04458 8A

The Ohio State University Version of the Stanford Streamflow Simulation Model: Part I - Technical Aspects,
W73-04542 2A

SUBJECT INDEX

OUTLET WORKS

The Ohio State University Version of the Stanford Streamflow Simulation Model: Part II - The Computer Program, W73-04543	2A	OIL WASTES Process and System for Control of Fluids in Water Disposal Surge Tanks, W73-04148	5D	Optimizing an Activated Carbon Wastewater Treatment Plant, W73-04421	5D
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part III - User's Manual, W73-04544	2A	OILY WATER Multi-Sensor Oil Spill Detection, W73-03946	5B	The Optimum Flocculant Concentration for Effective Flocculation of China Clay in Aqueous Suspension, W73-04477	5D
OHIO RIVER Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries, W73-04063	4A	OLIGOCHAETE WORMS Consumption of Oligochaete Worms by Fish and Invertebrates, (In Russian), W73-04520	2I	OPTIMUM DESIGN Automatic Designing of Transmission Lines and Substations, W73-04079	8C
OHIO STATE UNIVERSITY The Ohio State University Version of the Stanford Streamflow Simulation Model: Part I - Technical Aspects, W73-04542	2A	OLIGOMYCIN Inhibition of Oligomycin -Sensitive and -Insensitive Magnesium Adenosine Triphosphate Activity in Fish by Polychlorinated Biphenyls, W73-04176	5C	OREGON Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102	5B
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part II - The Computer Program, W73-04543	2A	ON-SITE DATA COLLECTIONS On-Site Digital Accumulation and Storage of Hydrologic Data for Use in Data Acquisition Systems, W73-04067	7C	The Thermal-Water Horticultural Demonstration Project at Springfield, Oregon, W73-04343	5G
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part III - User's Manual, W73-04544	2A	OPEN CHANNEL FLOW Shape Effects on Resistance in Flood-Plain Channels, W73-04213	8B	ORESUND 'Sun-Shade' Adaptation in Microbenthic Algae from the Oresund, W73-04519	5C
OIL POLLUTION Method and Apparatus for Controlling Substant Oil Seepage, W73-04128	5G	Longitudinal Dispersion in Sinuous Channels, W73-04214	5B	ORGANIC COMPOUNDS Determination of Hydrocarbon Residues in Water, W73-04007	5A
Oil Spillage Control Process, W73-04129	5G	Unit-Response Method of Open-Channel Flow Routing, W73-04215	8B	Relation Between Retention Indices and Boiling Points of Hydrocarbons Differing Slightly in Their Vapor Pressures, W73-04417	5A
Oil Collection Boom, W73-04134	5G	Estimating Discharge from Superelevation in Bends, W73-04219	8B	ORGANIC MATTER Photochemical Degradation of Sediment Organic Matter: Effect on ZN65 Release, W73-04319	5B
Process and System for Control of Fluids in Water Disposal Surge Tanks, W73-04148	5D	Unified Nondimensional Formulation for Open Channel Flow, W73-04223	8B	ORGANIC SOILS Postharvest Cultural Practices Affecting the Rooting of Kentucky Bluegrass Sods Grown on Organic and Mineral Soils, W73-04175	3F
Marine and Estuarine Pollution, W73-04237	5A	OPERATING COSTS Optimizing an Activated Carbon Wastewater Treatment Plant, W73-04421	5D	ORGANIC WASTES Wastewater Treatment Sequence, W73-04146	5D
Eden Preserved, W73-04466	5G	OPPORTUNITY COSTS Award Winning Water Treatment Plant Features Automation, W73-04447	5D	Electrochemical Oxygen Demand System, W73-04147	5A
OIL SEEPAGE Method and Apparatus for Controlling Substant Oil Seepage, W73-04128	5G	Opportunity Costs of a Transbasin Diversion of Water 1. Methodology, W73-04276	4A	Treating Liquid Waste Effluent, W73-04150	5D
OIL SPILLS The Remote Sensing of Oil Slicks, W73-03944	5B	OPTIMIZATION Optimal Design of Furrow Length of Surface Irrigation, W73-03975	3F	The BIO-Gas Plant: Generating Methane from Organic Wastes, W73-04157	5G
Oil Slick Studies Using Photographic and Multispectral Scanner Data, W73-03945	5B	Optimal Pricing Policies for Conjunctive Urban Water Supply and Waste Water Treatment Systems, W73-04060	5G	Chromatographic Detection of Water Contaminants, W73-04423	5A
Multi-Sensor Oil Spill Detection, W73-03946	5B	Selection of Test Variable for Minimal Time Detection of Basin Response to Natural or Induced Changes, W73-04061	4A	ORGANOMERCURY COMPOUNDS Inexpensive Mercury-Specific Gas Chromatographic Detector, W73-04242	5A
The Oceans Have Become the Sinks of the World, W73-03989	5C	Regional Development of Public Water Supply Systems, W73-04064	3D	OSMOTIC ULTRAFILTRATION Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters, W73-04390	5F
Oil Spillage Control Process, W73-04129	5G	Combined use of Optimization and Simulation Models in River Basin Planning, W73-04275	6A	OUTLET WORKS Evaluation of Flared Outlet Transitions, W73-04196	8B
Oil Collection Boom, W73-04134	5G				
Analytical Technique May Cut Oil Spills, W73-04429	5G				

SUBJECT INDEX

OVERBANK SEDIMENTATION

OVERBANK SEDIMENTATION
Overbank Sedimentation in the Delaware River Valley During the Last 6000 Years, W73-04194 2J

OVERLAND FLOW

Roughness in a Model of Overland Flow, W73-04508 8B

OXIDATION LAGOONS

Studies of the Influence of Lagoons and Landfills on Groundwater Quality, W73-04066 5B

Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India, W73-04496 5D

OXYGEN DEMAND

Electrochemical Oxygen Demand System, W73-04147 5A

OXYGENATION

Batch Sewage Treatment System, W73-04136 5D

Liquid Treatment Method, W73-04138 5D

OZONE ACTIVE-CARBON

Ozone Active Carbon Treatment of Sea Water for Swimming Pools, (In German), W73-04411 5D

PACIFIC COAST REGION

Quality of Surface Waters of the United States, 1967: Parts 9-11. Colorado River Basin to Pacific Slope Basins in California, W73-03924 7C

Measurements of Sea Surface Temperature on the Eastern Pacific Continental Shelf Using Airborne Infrared Radiometry, August 1963 - July 1968, W73-04352 7B

PACIFIC NORTHWEST U.S.

An Independent View of the Use of Thermal Power Station Cooling Water to Supplement Inter-Regional Water Supply, W73-04346 5G

Coastal Currents of Pacific Northwest, W73-04364 5B

PACIFIC OCEAN

Analysis of Turbidite Correlation in Cascadia Basin, Northeast Pacific Ocean, W73-04249 5B

Activation Analysis Trace-Element Studies for Marine Biological Samples, W73-04327 5A

PACIFIC SLOPE BASINS (CALIF.)

Quality of Surface Waters of the United States, 1967: Parts 9-11. Colorado River Basin to Pacific Slope Basins in California, W73-03924 7C

PALEOClimATOLOGY

Summary of Panel on Carbon Isotopes in Subsurface Hydrology and the Role of Paleoclimates in their Interpretation, W73-03957 2F

PALEOMAGNETISM

Paleomagnetic Studies of Bottom Sediments from the Indian Ocean Area of the Antarctic (Paleomagnitnyye issledovaniya dennykh otlozhennykh Indiyskogo sektora Antarktiki), W73-04516 2J

PARAMETRIC HYDROLOGY

Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin, W73-04277 6D

PARASTENOCARIS

A New Species of Parastenocaris (Crustacea, Copepoda) of the Hyporeic Ground Water of the Liscia River (Sardinia), (In Italian), W73-04378 5C

PARTICLE SIZE

Recent Sediments of the Central California Continental Shelf, Pigeon Point to Sand Hills Bluffs: Part B. Mineralogical Data, W73-03922 2J

Air Permeability as Related to Particle Size and Bulk Density in Sand System, W73-03972 2G

Particle Size of Mudflows on Carpathian Rivers in the Ukraine (Granulometricheskiy sostav selevkih otlozheniy na rekakh Ukrainskikh Karpat), W73-04119 2E

PATENTS

Method and Apparatus for Controlling Substant Oil Seepage, W73-04128 5G

Oil Spillage Control Process, W73-04129 5G

Sewage Treatment Plant and Method of Treating Sewage, W73-04130 5D

Internal Precipitation of Phosphate from Activated Sludge, W73-04131 5D

Method of Water Filtration, W73-04132 5D

Method and Apparatus for Softening or Desalting Water by Ion Exchange, W73-04133 3A

Oil Collection Boom, W73-04134 5G

Reverse Osmosis Water Purifier, W73-04135 3A

Batch Sewage Treatment System, W73-04136 5D

Fluid Pollution Eradicator System Including an Air Bubble Scrubbing Unit, W73-04137 5D

Liquid Treatment Method, W73-04138 5D

Treatment of Sewage, W73-04139 5D

Combined Steam Power Plant and Water Distillation System, W73-04140 3A

Sewage Treatment System, W73-04141 5D

Method and Apparatus for Removing Sludge from Liquid, W73-04142 5D

Liquid and Sludge Treatment, W73-04143 5D

Tertiary Filtering Arrangement,

W73-04144 5D

Method and Apparatus for Water Softening, W73-04145 3A

Wastewater Treatment Sequence, W73-04146 5D

Electrochemical Oxygen Demand System, W73-04147 5A

Process and System for Control of Fluids in Water Disposal Surge Tanks, W73-04148 5D

Atmospheric Water Collector, W73-04149 3B

Treating Liquid Waste Effluent, W73-04150 5D

Backflushing Filter, W73-04151 5D

Method and Apparatus for Clarifying Liquids, W73-04152 5D

Floatable Breakwater Element, W73-04153 8A

PATH OF POLLUTANTS
The Remote Sensing of Oil Slicks, W73-03944 5B

Oil Slick Studies Using Photographic and Multispectral Scanner Data, W73-03945 5B

Adsorption and Concentration of Dissolved Carbon-14-DDT by Coloring Colloids in Surface Waters, W73-04012 5B

Mercury in Fish - Total Content in Freshwater and Marine Fishes (VII. (Totaal) Kwikgehalte van Zeevatten Zeevissen), W73-04044 5C

Absorption of Water by a Soil from a Circular Cylindrical Source, W73-04200 5B

Line Source Distributions in Two Dimensions: Applications to Water Quality, W73-04201 5B

Relative Diffusion in Nonisotropic Turbulence, W73-04212 5B

Dispersion From Pit in Uniform Seepage, W73-04222 5B

Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report, W73-04290 5B

As Investigation into the Determination of Plutonium in Soil by a Fusion Procedure, W73-04295 5B

Coastal Currents of Pacific Northwest, W73-04364 5B

Salmonellae as an Index of Pollution of Surface Waters, W73-04426 5A

Bacterial Reduction of Arsenate in Sea Water, W73-04479 5B

SUBJECT INDEX

Measurements of Movements of Solid Substances in Water by Means of Stable Tracers and Activation Analysis,	W73-04490	5B	PERMISSABLE LOADINGS	The Case for Higher Rate Waste Water Treatment,	W73-04445	5D	PLAQUEMINE LOCK (LA.)				
A Review of the Arsenic Cycle in Natural Waters,	W73-04541	5B	PERMSELECTIVE MEMBRANES	Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters,	W73-04390	5F	Photogrammetry and Hydraulic Surfaces,	W73-04368	7B		
PATHOGENIC BACTERIA	Microbiology of Water,	W73-04235	5B	PERU	The Pleistocene Moraine Stages of West-Central Peru,	W73-03931	2C	PHOTOMULTIPLIER DETECTOR	Some Comments on the Signal-to-Noise Characteristics of Real Photomultiplier and Photodiode Detection Systems,	W73-04419	7B
Improved Procedure for Identification of Group D Enterococci with Two New Media,	W73-04253	5A	PESTICIDE RESIDUES	Pesticide Regulations and Residue Problems in Japan,	W73-04042	5B	PHOTOSYNTHESIS	Photosynthetic Response to Drought in Maize,	W73-04260	3F	
PATHOGENICITY	Temperature Tolerance of Pathogenic and Non-pathogenic Free-Living Amoebas,	W73-04330	5C	PESTICIDES	The Uptake of Insecticides by Freshwater Mussels and the Effects of Sublethal Concentrations of Insecticides on These Mussels,	W73-03904	5C	PHYSICOCHEMICAL SOIL PROPERTIES	Mountain Meadow Steppe Soils of the Chatkal Range (In Russian),	W73-04164	2G
PEAK DISCHARGE	Rainfall and Runoff in Urban Areas: Theory and Prediction,	W73-04357	4C	PER	Large, Inexpensive Oven used to Decontaminate Glassware for Environmental Pesticide Analysis,	W73-04394	5A	PHYTOPLANKTON	Ecological Factors Influencing Production of Algae in Northern Prairie Lakes,	W73-03909	5C
Flood of September 20-23, 1969, in the Gadsden County Area, Florida,	W73-04535	2E	PETROLEUM PRODUCTS	Effect of Petroleum and Petroleum Products on Sturgeon and Other Fish, (In Russian),	W73-04495	5C	Cooling Water Chlorination and Productivity of Entrained Phytoplankton,	W73-04427	5F		
PECOS RIVER BASIN	Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,	W73-04277	6D	PHARMACOLOGY	A Physicochemical Rationale for the Biological Activity of Mercury and Its Compounds,	W73-04054	5C	PHYTOTOXICITY	Factors Affecting Plant Uptake and Phytotoxicity of Cadmium Added to Soils,	W73-04058	5B
PENETRATION	Penetration of Free-Falling Objects Into Deep-Sea Sediments,	W73-04195	2J	PHILADELPHIA	Control of the Anserobic Digestion Process and Supporting Unit Processes,	W73-04430	5D	PICKLING LIQUORS	Tannery Effluents and Their Treatment - Part I,	W73-04550	5D
PENNSYLVANIA	Control of the Anaerobic Digestion Process and Supporting Unit Processes,	W73-04430	5D	PHOSPHATES	Internal Precipitation of Phosphate from Activated Sludge,	W73-04131	5D	PITT-TAYLOR RESERVOIRS (NEV)	Bathymetric Reconnaissance of Rye Patch Reservoir and the Pitt-Taylor Reservoirs, Pershing County, Nevada,	W73-04227	7C
PENSACOLA (FLA.)	Construction of Waste-Injection Monitor Wells Near Pensacola, Florida,	W73-04536	5E	PHILADELPHIA	Control of the Anserobic Digestion Process and Supporting Unit Processes,	W73-04430	5D	PLANKTON	Analysis of Turbidite Correlation in Cascadia Basin, Northeast Pacific Ocean,	W73-04249	5B
PERCHLORATES	Perchlorate Determination by Thermometric Enthalpy Titration,	W73-04230	5A	PHOSPHATES	Carbonate and Phosphate Detergent Builders: Their Impact on the Environment,	W73-04440	5C	The Eutrophication Problem,	W73-04403	5C	
PERCOLATION	Water Pressure in Intra- and Subglacial Channels,	W73-03927	2C	PHOSPHORIC ACID RECOVERY	Adsorption Process Eases Acid Recovery.	W73-04005	5D	Production of Mass Forms of Planktonic Crustaceans in Lake Ilmen (In Russian),	W73-04548	2H	
PERIPHYTON	A Method of Collecting Periphyton in Lentic Habitats with Procedures for Subsequent Sample Preparation and Quantitative Assessment,	W73-04270	2L	PHOSPHORUS	Nitrogen and Phosphorus Dynamics in Three Central Texas Impoundments,	W73-04484	5C	PLANNING	National Water Research Opportunities,	W73-03911	6B
PERMEABILITY	Water Permeability of Frozen Soil in Connection with Anterior Conservation Tillage of Fall-Plowed Soil on Slopes, (In Ukrainian),	W73-03916	2G	PHOSPHORUS RADIOISOTOPES	Seasonal Concentration, Turnover, and Mode of Accumulation of p32 by the Juvenile Starry Flounder in the Columbia River Estuary, <i>Platichthys Stellatus</i> (Pallas),	W73-04322	5C	Planning Concrete Dam Construction Control Surveys,	W73-04077	8A	
Air Permeability as Related to Particle Size and Bulk Density in Sand System,	W73-03972	2G	PHOTODIODE DETECTOR	Some Comments on the Signal-to-Noise Characteristics of Real Photomultiplier and Photodiode Detection Systems,	W73-04419	7B	Combined use of Optimization and Simulation Models in River Basin Planning,	W73-04275	6A		
PERMEAMETERS	Rapid Measurement of Hydraulic Conductivity Changes in Slowly Permeable Soils,	W73-03968	2G	PHOTOGRAHAMMETRY	Energy Spectra of Sea Waves from Photographic Interpretation,	W73-03939	7B	Opportunity Costs of a Transbasin Diversion of Water 1. Methodology,	W73-04276	4A	
							PLANTS	Factors Affecting Plant Uptake and Phytotoxicity of Cadmium Added to Soils,	W73-04058	5B	
							PLAQUEMINE LOCK (LA.)	Plaquemine Lock Closure, Mississippi River and Tributaries Project, Iberville Parish, Louisiana, Associated Water Features, Bayou Plaquemine and Gulf Intracoastal Waterway (Final Environmental Impact Statement).	W73-04457	8D	

SUBJECT INDEX

PLATINUM OXYGEN CATHODE

PLATINUM OXYGEN CATHODE
Determination of a Water Table in a Soil Profile Using the Platinum Oxygen Cathode, W73-03985 2G

PLEASANTON (CALIF)
Former Camp Parks Sewage Disposal Plant, Parcel A-2 Pleasanton, California (Final Environmental Impact Statement). W73-04474 5G

PLEISTOCENE EPOCH
The Pleistocene Moraine Stages of West-Central Peru, W73-03931 2C

PLUME DISPERSION
Cooling Tower Plume Rise and Condensation, W73-04025 5D

PODZOLIC SOILS
An Investigation into the Determination of Plutonium in Soil by a Fusion Procedure, W73-04295 5B

PODZOLIZED SOILS
Moisture Regime of Sod Podzolic Soils in Different Farmlands, (In Russian), W73-04269 2G

POLIOVIRUS 1
A Comparative Study of the Inactivation of Viruses in Water by Chlorine, W73-03991 5F

POLLUTANT EFFECTS
Effects of Various Soil Fungi and Insecticides on the Capacity of *Mucor alternans* to Degrade DDT, W73-04232 5B

POLLUTANT IDENTIFICATION
Mercury in Fish - Imported Tinned Fish, (IX. Kwikgehalten van een Aantal Sorten Ingeblikte Vis), W73-04045 5C

Mercury in the Environment - Techniques of Analysis (XIII. Analysetechnieken voor Kwik in Het Milieu), W73-04046 5A

Sources of Error and Confirmation in the Determination of Methylmercury Radicals, W73-04050 5A

Activation Analysis of Mercury and Other Environmental Pollutants in Water and Aquatic Ecosystems, W73-04051 5A

3-Propyl-5-Hydroxy-5-D-Arabinotetrahydroxybutyl-3-Thiazolidine-2-Thione, A Specific Colorimetric Reagent for the Determination of Copper in Water, W73-04056 5A

Mercury Detection by Means of Thin Gold Films, W73-04123 5A

Studies on Variants of *Bacillus Stearothermophilus* Strain NCA 1518, W73-04246 5A

Some Observations on the Reduction of 2,3,5-Triphenyltetrazolium Chloride by Escherichia Coli, W73-04250 5B

Improved Procedure for Identification of Group D Enterococci with Two New Media, W73-04253 5A

Rapid Separation of Metal Chelates by Column Liquid-Liquid Chromatography using Ultraviolet Detection, W73-04391 5A

Microbes as Tracers of Water Movement, W73-04392 5B

Thin Layer Chromatographic Detection of Chlorinated Hydrocarbons as Cross-Contaminants in Pesticide Formulations, W73-04396 5A

Analysis for Crude Fatty Acids (Total Fatty Acid and Unsaponifiable Matter) in Feed Grade Fats: Report of the Joint AOAC-AOCS Committee on the Analysis of Feed Grade Fats, W73-04397 5A

Modification of Schaefer's Procedure for Serotyping of Organisms of the Mycobacterium-M. Intracellulare-M. Scrofulaceum Complex, W73-04398 5A

Influence of Amalgam Formation on Cyclic Voltammetry, W73-04410 5A

Species Identification in Visible-Ultraviolet Vapor, W73-04418 5A

Salmonellae as an Index of Pollution of Surface Waters, W73-04426 5A

POLLUTANTS
Polychlorinated Biphenyls: Still Prevalent, But Less of A Problem, W73-04006 5C

Study of the Metabolization of Pollutant Products, W73-04402 5B

POLLUTION ABATEMENT
Polychlorinated Biphenyls: Still Prevalent, But Less of A Problem, W73-04006 5C

Optimal Pricing Policies for Conjunctive Urban Water Supply and Waste Water Treatment Systems, W73-04060 5G

A Dynamic Programming Study of Various Diversion Losses, W73-04068 4A

Method and Apparatus for Controlling Substant Oil Seepage, W73-04128 5G

Oil Spillage Control Process, W73-04129 5G

Oil Collection Boom, W73-04134 5G

The Expansion of Federal Common Law and Federal Question Jurisdiction to Interstate Pollution, W73-04461 5G

POLLUTION IDENTIFICATION
Determination of Hydrocarbon Residues in Water, W73-04007 5A

POLLUTION TAXES (CHARGES)
Optimal Pricing Policies for Conjunctive Urban Water Supply and Waste Water Treatment Systems, W73-04060 5G

POLYCHLORINATED BIPHENYLS
Polychlorinated Biphenyls: Still Prevalent, But Less of A Problem, W73-04006 5C

Inhibition of Oligomycin -Sensitive and -Insensitive Magnesium Adenosine Triphosphate Activity in Fish by Polychlorinated Biphenyls, W73-04176 5C

POLYETHYLENE OXIDE SOLUTIONS
Rheology of Friction-Reducing Polymer Solutions, W73-03913 8B

POLYMERS
Rheology of Friction-Reducing Polymer Solutions, W73-03913 8B

PONDING
Sprinkling and Ponding Techniques for Reclaiming Saline Soils, W73-04081 3F

PONDS
An Inventory of the Ponds, Lakes and Reservoirs of Massachusetts, Berkshire and Franklin Counties, W73-04069 2H

POPULATION
The Instability of Ocean Populations, W73-04240 5C

POROUS MEDIA
The Effect of the Entrapped Air on the Hysteresis Curves of A Porous Body and on its Hydraulic Conductivity, W73-03969 2G

Air Permeability as Related to Particle Size and Bulk Density in Sand System, W73-03972 2G

POTABLE WATER
Determination of Hydrocarbon Residues in Water, W73-04007 5A

Atmospheric Water Collector, W73-04149 3B

Differences of Bacterial Groups of Nutrient Media in the Determination of Germ Groups in Water (In German), W73-04257 5A

POTASSIUM
The Concentration of K, CA, and MG in the Saturation Extract in Relation to Exchangeable K, CA, and MG, W73-03970 2K

SUBJECT INDEX

RADAR

POTATO SCAB		
Effects of Irrigation, Manganese Sulphate and Sulphur Applications on Common Scab of the Potato, W73-04167	SG	Invertebrates Sampled from the Waters Ad-jacent to Panama and Columbia, W73-04307
Common Potato Scab: Effects of Irrigation, Manganese Sulphate and Sulphur Treatments for Common Potato Scab on Mineral Composi-tion of Plant Material and Soil Extracts, W73-04168	SG	SC
POTETOMETER		Radioactive Wastes, W73-04312
Method for the Direct Measurement of Ab-solute Water Consumption of Woody Plants (In German), W73-04177	2I	SD
POTOMAC RIVER		Outcry Over Exposure Guidelines, W73-04314
A Report on the Prototype Data Collected in the Potomac River for the Chesapeake Bay Model Study, W73-04101	2L	SG
POULTRY		Nuclear Activation Analysis of Se, As, Zn, Cd, and Hg in Environmental Matrices, W73-04328
Dehydrated Poultry Waste in Poultry Rations, W73-03992	5E	SA
POWER PLANTS		PUBLIC RELATIONS
Combined Steam Power Plant and Water Distil-lation System, W73-04140	3A	Corporate Checkpoints to Pollution Control, W73-04483
POWERPLANTS		PUBLICATIONS
Power Plant Cooling Systems, W73-04029	5D	Sedimentation-Annotated Bibliography of Foreign Literature for 1969 and 1970, Survey No 7, W73-04507
Pumped Storage and Tidal Power in Energy Systems, W73-04033	5G	2J
Circulating Water Systems Without Valves, W73-04035	5D	PUERTO RICO
Large Power Plant Effluent Study (Lappes) Volume 3 - Instrumentation, Procedures, and Data Tabulations (1970), W73-04121	5A	Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico, W73-04241
PRE-IMPOUNDMENT		SC
Hydrologic Aspects of Freshening Upper Old Tampa Bay, Florida, W73-04094	2H	Radiological Physics Division Annual Report. Environmental Research, Jan.-Dec. 1971, W73-04303
PRECIPITABLE WATER		SA
On the Correlation of the Total Precipitable Water in a Vertical Column and Absolute Hu-midity at the Surface, W73-03923	2B	PUGET SOUND
PRECIPITATION		Studies of the Natural Alpha-Emitting Radioisotopes in Marine Organisms, W73-04320
The Possibility of Estimating the Soil Moisture Reserve From Precipitation Data (In Russian), W73-04019	2B	SB
Study of Rainout of Radioactivity in Illinois. W73-04052	5B	PULP WASTES
PRECIPITATION (ATMOSPHERIC)		Water Pollution Control in Pulp and Paper In-dustry, W73-04424
On the Correlation of the Total Precipitable Water in a Vertical Column and Absolute Hu-midity at the Surface, W73-03923	2B	SD
Chemical Composition of Atmospheric Precipitation in the Deputatskiy Region (K-himicheskiy sostav atmosfernykh osadkov, vypadayushchikh na territorii Deputatskogo rayona), W73-04511	2B	PUMPED STORAGE
		Pumped Storage and Tidal Power in Energy Systems, W73-04033
		SG
PROFILES		PUMPS
Photogrammetry and Hydraulic Surfaces, W73-04368	7B	Circulating Water Systems Without Valves, W73-04035
PROJECTIONS		SD
What is Expected in In-Plant Control and Waste Treatment in the Future, W73-04437	5D	PYRAZINES
Higher Standards: The Local Authorities View, W73-04492	5F	Raman Spectra-Structure Correlation for Pyrazines. New Method for Obtaining Spectra of Trapped Nanoliter Gas Chromatograph Fractions, W73-04388
PROPANE		SA
Pollution Control Briefs. W73-03998	5D	RADAR
PROSTHECATE BACTERIA		Radar Cross-Section Measurements of Snow and Ice, W73-03920
Incidence of Prosthecate Bacteria in a Polluted Stream, W73-04265	5B	2C
PROTEIN		Lake Ice Surveillance Via Airborne Radar: Some Experimental Results, W73-03937
Dried Animal Waste as a Protein Supplement for Sheep, W73-04449	5E	7B
PROTOTYPES		The Remote Sensing of Oil Slicks, W73-03944
Mercury Detection by Means of Thin Gold Films, W73-04123	5A	SB
PUBLIC ATTITUDES		Multi-Sensor Oil Spill Detection, W73-03946
Data Record for Public Attitudes Toward Reuse of Reclaimed Water, W73-04059	6B	SB
PUBLIC HEALTH		Determination of Sea Ice Drift Using Side-Looking Airborne Radar, W73-03951
Stable Element Concentrations and Estimations of the Radionuclide Contents in the Fish and		7B
		Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102
		SB

SUBJECT INDEX

RADIATION

- RADIATION**
The Dose to Man from Atmospheric KR-85,
W73-04291 5B
- RADIO INTERFERENCE**
Radio Interference From HVDC Converter
Stations,
W73-04084 8C
- RADIOACTIVE DATING**
Summary of Panel on Carbon Isotopes in Sub-
surface Hydrology and the Role of Paleoclimate
in their Interpretation.
W73-03957 2F
- RADIOACTIVE TRACERS**
Radiocarbon in the Sea,
W73-04292 5B
- RADIOACTIVE WASTE DISPOSAL**
Radioactive Wastes,
W73-04239 5B
- RADIOACTIVE WASTES**
Absorption of Water by a Soil from a Circular
Cylindrical Source,
W73-04200 5B
- Dispersion From Pit in Uniform Seepage,
W73-04222 5B
- Radioactive Wastes,
W73-04239 5B
- RADIOACTIVITY**
Study of Rainout of Radioactivity in Illinois.
W73-04052 5B
- Radionuclides in Lake Michigan Fish,
W73-04306 5A
- Environmental Surveillance at Hanford for CY-
1971,
W73-04310 5A
- Iodine-129 in the Environment Around a
Nuclear Fuel Reprocessing Plant,
W73-04311 5A
- Radioactive Wastes,
W73-04312 5D
- Fallout Program. Quarterly Summary Report,
June 1, 1972 Through Sept. 1, 1972,
W73-04315 5B
- The 1971 Tritium Symposium at Las Vegas,
W73-04318 5A
- RADIOACTIVITY EFFECTS**
Techniques for the Characterization of
suspended Sediment and Selected Applications
for the Acquired Data,
W73-04302 5B
- Radiological Physics Division Annual Report.
Environmental Research, Jan.-Dec. 1971,
W73-04303 5A
- RADIOACTIVITY TECHNIQUES**
An Investigation into the Determination of Plu-
tonium in Soil by a Fusion Procedure,
W73-04295 5B
- RADIOECOLOGY**
Russian Radioecology. A Bibliography of
Soviet Publications with Citations of English
Translations and Abstracts,
W73-04298 5B
- Ecological Studies of Radioactivity in the
Columbia River Estuary and Adjacent Pacific

- Ocean, Progress Report, July 1, 1971-June 30,
1972,
W73-04299 5B

- RADIOISOTOPES**
Treatment of Sewage,
W73-04139 5D

- The Dose to Man from Atmospheric KR-85,
W73-04291 5B

- Russian Radioecology. A Bibliography of
Soviet Publications with Citations of English
Translations and Abstracts,
W73-04298 5B

- Photochemical Degradation of Sediment Or-
ganic Matter: Effect on ZN65 Release,
W73-04319 5B

- Concentration of C-14 in the Troposphere Dur-
ing 1953 to 1971, (In Russian),
W73-04323 5A

- Behavior of CS-137 and CE-144 in the Sorption
System Sea Water-Sediment,
W73-04324 5A

- RADIOSONDES**
Use of Surface Observations in Boundary-
Layer Analysis,
W73-04333 7C

- RADIUM RADIOISOTOPES**
Studies of the Natural Alpha-Emitting
Radioisotopes in Marine Organisms,
W73-04320 5B

- RAIN**
Chemical Composition of Atmospheric
Precipitation in the Deputatskiy Region (K-
himicheskiy sostav atmosfernykh osadkov,
vypadayushchikh na territorii Deputatskogo
rayona),
W73-04511 2B

- RAIN GAGES**
Spatial Analysis of Rainfall Data from Dense
Networks,
W73-04383 7C

- Calculation of Areal Rainfall Using Finite Ele-
ment Techniques with Altitudinal Corrections,
W73-04385 7C

- RAIN WATER**
Development of Economic Water Harvest
Systems for Increasing Water Supply - Phase
II,
W73-03901 3B

- Study of Rainout of Radioactivity in Illinois.
W73-04052 5B

- RAINFALL**
Sheet Flow Under Simulated Rainfall,
W73-03921 2B

- Some Single- and Multi-Site Models of Rainfall
Within Discrete Time Increments,
W73-04372 2B

- RAINFALL DISPOSITION**
Investigation of Storm Runoff on Small
Watersheds in Lowlands of the Ukraine (Iss-
ledovaniye poter' dozhevogo stoka na malykh
vodosborakh ravninnoy territorii Ukrayiny),
W73-04113 2E

- The Spottiness of Rainfall in a Desert Area,
W73-04532 2B

RAINFALL INTENSITY

- Investigation of Storm Runoff on Small
Watersheds in Lowlands of the Ukraine (Iss-
ledovaniye poter' dozhevogo stoka na malykh
vodosborakh ravninnoy territorii Ukrayiny),
W73-04113 2E

RAINFALL-RUNOFF RELATIONSHIPS

- Sheet Flow Under Simulated Rainfall,
W73-03921 2B

- Investigation of Storm Runoff on Small
Watersheds in Lowlands of the Ukraine (Iss-
ledovaniye poter' dozhevogo stoka na malykh
vodosborakh ravninnoy territorii Ukrayiny),
W73-04113 2E

- Effect of Underlying Formations on Annual
Runoff in Lowlands of the Dniester River
Basin (Vliyanie na godovoy stok
osobennostey podstilayushchey poverkhnosti
ravninnoy chasti basseyna Dnestr'a),
W73-04117 2E

- Rainfall and Runoff in Urban Areas-A Case
Study of Flooding in the Piedmont of North
Carolina,
W73-04356 4C

- Properties of the Kernels for Time Invariant,
Initially Relaxed, Second Order, Surface Ru-
noff Systems,
W73-04371 2A

- Roughness in a Model of Overland Flow,
W73-04508 8B

- An Index of Flood-Producing Rainfall Based on
Rainfall and Soil Moisture Deficit,
W73-04528 2A

- The Output of a Lowland Catchment,
W73-04533 3B

- RAINOUTS**
Study of Rainout of Radioactivity in Illinois.
W73-04052 5B

- RAMAN SPECTRA**
Raman Spectra-Structure Correlation for
Pyrazines. New Method for Obtaining Spectra
of Trapped Nanoliter Gas Chromatograph
Fractions,
W73-04388 5A

- RATES**
Yearly Respiration Rate and Estimated Energy
Budget for Sagitta elegans,
W73-04400 5B

- RATIONAL FORMULA**
Rainfall and Runoff in Urban Areas: Theory
and Prediction,
W73-04357 4C

- REACTION RATES**
Reduction of Chromate by Zinc at Constant
pH's. Chemistry of Chromate Treatment (Part
2) (In Japanese),
W73-04282 5D

- REASONABLE USE**
Bauerle V. Board of County Road Com-
missioners for the County of Charlevoix (All
Riparian Owners Accorded Reasonable Use of
Surface of Entire Lake).
W73-04470 6E

SUBJECT INDEX

RESERVOIRS

RECHARGE			
Comparison of Recharge to Groundwater Under Pasture and Forest Using Environmental Tritium, W73-04373	2F	Regional Development of Public Water Supply Systems	
Water Table Fluctuations Under Forest and Pasture in a Karstic Region of Southern Australia, W73-04374	2F	Regional Development of Public Water Supply Systems, W73-04064	3D
RECLAIMED WATER			
Conquest of Wastes Show Productivity, W73-03979	3F	Ecological Factors Influencing Production of Algae in Northern Prairie Lakes, W73-03909	5C
Waste Water Reuse-A Supplemental Supply, W73-03987	5D	Sheet Flow Under Simulated Rainfall, W73-03921	2B
Reclamation and Industrial Reuse of Amarillo's Waste Water, W73-03988	5D	Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries, W73-04063	4A
Data Record for Public Attitudes Toward Reuse of Reclaimed Water, W73-04059	6B	Comparison of Multiple Regression and Principal Component Regression for Predicting Water Yields in Kentucky, W73-04199	4A
RECLAMATION			
Stream Faunal Recovery After Manganese Strip Mine Reclamation, W73-04546	5C	RELIABILITY	
Stream Faunal Recovery After Manganese Strip Mine Reclamation, W73-04546	5C	Analytical Technique May Cut Oil Spills, W73-04429	5G
RECOVERY			
Dehydrated Poultry Waste in Poultry Rations, W73-03992	5E	REMOTE SENSING	
Waste Acid to be Recovered and Refused, W73-04015	5D	Lake Ice Surveillance Via Airborne Radar: Some Experimental Results, W73-03937	7B
Processes Wastes for Profit, W73-04289	5D	Remote Sensing of the Arctic Ice Environment, W73-03938	7B
RED CEDAR RIVER (MICH)			
The Uptake of Insecticides by Freshwater Mussels and the Effects of Sublethal Concentrations of Insecticides on These Mussels, W73-03904	5C	Energy Spectra of Sea Waves from Photographic Interpretation, W73-03939	7B
RED OAK (TEX)			
Construction of Wastewater Facilities, Red Oak, Texas (Final Environmental Impact Statement), W73-04468	5G	An Experimental Model for Automated Detection, Measurement and Quality Control of Sea-Surface Temperatures From ITOS-IR Data, W73-03940	7C
RED SEA			
Red Sea Drilling, W73-04193	2J	A Method for Calculating Water Depth, Attenuation Coefficients and Bottom Reflectance Characteristics, W73-03941	7B
REDUCTION (CHEMICAL)			
Reduction of Chromate by Zinc at Constant pH's. Chemistry of Chromate Treatment (Part 2) (In Japanese), W73-04282	5D	Sea Surface Temperature Mapping off the Eastern United States Using NASA's Ito Satellite, W73-03942	7B
Reduction of Aromatic Fluorine Compounds, W73-04412	5B	Surface Water Movement Studies Utilizing a Tracer Dye Imaging System, W73-03943	7B
REGIONAL ANALYSIS			
Regional Development of Public Water Supply Systems, W73-04064	3D	The Remote Sensing of Oil Slicks, W73-03944	5B
REGIONAL DEVELOPMENT			
Regional Development of Public Water Supply Systems, W73-04064	3D	Oil Slick Studies Using Photographic and Multispectral Scanner Data, W73-03945	5B
		Multi-Sensor Oil Spill Detection, W73-03946	5B
		Remote Sensing Considerations for Water Quality Monitoring, W73-03947	5B
		A Technique for the Comparison of Contact and Non-Contact Measurements of Water Surface Temperature, W73-03948	7B
		Thermal Scanner Observations over Lake Ontario, W73-03949	7B
		Microwave Emission From Snow--A Progress Report, W73-03950	7B
		Determination of Sea Ice Drift Using Side-Looking Airborne Radar, W73-03951	7B
		Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102	5B
		Measurements of Sea Surface Temperature on the Eastern Pacific Continental Shelf Using Airborne Infrared Radiometry, August 1968 - July 1968, W73-04352	7B
		REOVIRUS	
		Concentration of Reovirus and Adenovirus From Sewage and Effluents by Protamine Sulfate (Salmine) Treatment, W73-03995	5D
		RESEARCH AREAS	
		National Water Research Opportunities, W73-03911	6B
		RESEARCH FACILITIES	
		Ecological Studies of Radioactivity in the Columbia River Estuary and Adjacent Pacific Ocean, Progress Report, July 1, 1971-June 30, 1972, W73-04299	5B
		RESEARCH MANAGEMENT	
		National Water Research Opportunities, W73-03911	6B
		RESEARCH NEEDS	
		National Water Research Opportunities, W73-03911	6B
		RESEARCH PRIORITIES	
		National Water Research Opportunities, W73-03911	6B
		RESERVOIR CONSTRUCTION	
		To Authorize Construction, Operation and Maintenance of the North Loup Division, Pick-Sloan Missouri Basin Program, Nebraska, W73-04459	6E
		RESERVOIR FILLING	
		Movements in Dams Due to Reservoir Filling, W73-04073	8D
		RESERVOIR LEAKAGE	
		Seepage From Shallow Reservoir, W73-04221	4A
		RESERVOIR OPERATION	
		Before and After Studies of the Effects of a Power Plant Installation on Lake LBJ - Measurement and Prediction of Abnormal Reservoir Operations on Lake LBJ's Water Quality, W73-04336	5B
		RESERVOIR STORAGE	
		Nitrogen and Phosphorus Dynamics in Three Central Texas Impoundments, W73-04484	5C
		RESERVOIRS	
		Utilization of Deep Water Heat in Reservoirs for the Maintenance of Unfrozen Water Areas, W73-04034	2C
		An Inventory of the Ponds, Lakes and Reservoirs of Massachusetts, Berkshire and Franklin Counties, W73-04069	2H

SUBJECT INDEX

RESERVOIRS

Bathymetric Reconnaissance of Rye Patch Reservoir and the Pitt-Taylor Reservoirs, Pershing County, Nevada, W73-04227

7C

Before and After Studies on the Effects of a Power Plant Installation on Lake LBJ - a Numerical Temperature Model for Lake LBJ, W73-04335

5B

Flexible Pricing in Water Supply Planning--For Flexible Engineers, W73-04354

6A

Phosphorescent Vibrios in Reservoirs of Turkmenia, (In Russian), W73-04489

5C

The Physicochemical Limnology of a Stretch of the Guadalupe River, Texas, With Five Main-Stream Impoundments, W73-04505

2H

RESIDENCE TIME

The Chemical History of Some Spring Waters in Carbonate Rocks, W73-03959

5B

RESIDUES

Pesticide Regulations and Residue Problems in Japan, W73-04042

5B

RESINS

Method and Apparatus for Water Softening, W73-04145

3A

Ion Exchange for the Metal Products Finisher-Part I, W73-04497

5D

RESISTIVITY

Methods for the Calculation of True Formation Factors in the Bunter Sandstone of Northwest England, W73-04534

2F

RESPIRATION

Yearly Respiration Rate and Estimated Energy Budget for Sagitta elegans, W73-04400

5B

Study of the Metabolization of Pollutant Products, W73-04402

5B

RETAINING WALLS

Lateral Pressures From Soft Clay, W73-04367

8D

RETENTION INDEX

Relation Between Retention Indices and Boiling Points of Hydrocarbons Differing Slightly in Their Vapor Pressures, W73-04417

5A

REVERSE OSMOSIS

Reverse Osmosis Water Purifier, W73-04135

3A

Reverse Osmosis for Waste Water Treatment: What, When., W73-04187

5D

Reverse Osmosis for Wastewater Treatment, W73-04487

5D

Reverse Osmosis Can Cut Cost of Water Treatment, W73-04549

5D

REVIEWS

Methylmercury, A Review of Health Hazards and Side Effects Associated with the Emission of Mercury into Natural Systems, W73-04127

5C

Microbiology of Water, W73-04235

5B

Effects on Freshwater Fish, W73-04236

5C

Marine and Estuarine Pollution, W73-04237

5A

Water Pollution. Freshwater Macroinvertebrates, W73-04238

5C

Radioactive Wastes, W73-04239

5B

Radioactive Wastes, W73-04312

5D

Literature Search for Atmospheric Humidity Profile Models from the Sea Surface to 1,000 Meters, W73-04332

7C

Planning for Coastal Ports on a Systems Basis: Preliminary Methodological Design, W73-04525

8A

RHEOLOGY

Rheology of Friction-Reducing Polymer Solutions, W73-03913

8B

A Model of a Surging Glacier, W73-03933

2C

RHINE RIVER

Europe's Majestic Sewer, W73-04428

5G

RIPARIAN RIGHTS

Texas Seashore Boundary Law: The Effect of Natural and Artificial Modifications, W73-04460

6E

Bauerle V. Board of County Road Commissioners for the County of Charlevoix (All Riparian Owners Accorded Reasonable Use of Surface of Entire Lake). W73-04470

6E

RISKS

Flexible Pricing in Water Supply Planning--For Flexible Engineers, W73-04354

6A

RIVER BASIN

Navigation as One Source of Pollution of Water Basins by Carcinogenic Hydrocarbons (In Russian), W73-04186

5B

RIVER BASIN DEVELOPMENT

River Basin Monetary Authorizations--1969, Chesapeake Bay Basin in Comprehensive Study, W73-04454

6E

To Authorize Construction, Operation and Maintenance of the North Loup Division, Pick-Sloan Missouri Basin Program, Nebraska. W73-04459

6E

Savannah River Basin Inspection. W73-04472

6E

Genesee River Basin, New York and Pennsylvania (Final Environmental Impact Statement), W73-04475

8A

RIVER BASINS

Hydrologic Regimen of Lower Tonto Creek Basin, Gila County, Arizona--A Reconnaissance Study, W73-04099

3B

Combined use of Optimization and Simulation Models in River Basin Planning, W73-04275

6A

Opportunity Costs of a Transbasin Diversion of Water 1. Methodology, W73-04276

4A

Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava), W73-04512

2J

RIVER RESTORE

The Polluted Waters in Umbria: III. The River Nestore, (In Italian), W73-04393

5B

RIVERS

Investigation and Calculation of Components in the Hydrologic Regime of Rivers (Issledovaniya i raschety elementov hidrologicheskogo rezhima rek). W73-04111

2E

Seasonal Sediment Yield Patterns of U.S. Rivers, W73-04205

2J

Hydraulic Roughness of Ice Covers, W73-04218

2C

RIVERS AND HARBORS ACT

River Basin Monetary Authorizations--1969, Chesapeake Bay Basin in Comprehensive Study, W73-04454

6E

Report of the Chief of Engineers to the Secretary of the Army on a Study of Streambank Erosion in the United States. W73-04473

6E

ROCK SUBSTRATE

Lichenometric Indication of the Time of Exposure of a Rock Substrate, (In Russian), W73-04334

7B

ROCKFILL DAMS

Movements in Dams Due to Reservoir Filling, W73-04073

8D

Earth and Earth-Rock Dams, W73-04074

8D

ROCKPOOLS

Studies on Chemical, Physical and Biological Conditions in Swedish Rockpool Ecosystems, W73-04191

2H

ROCKS

Effect of Underlying Formations on Annual Runoff in Lowlands of the Dniester River Basin (Vliyanie na godovoy stok osobennostey podstonykh poverkhnostiv ravninnoy chasti basseyna Dnestra), W73-04117

2E

ROCKY MOUNTAIN REGION

Thermal and Mineral Springs in the Southern Rocky Mountains of Canada, W73-04363

4B

SUBJECT INDEX

SANDS

ROOT SYSTEMS		
Flow of Water into Ceramic Tubes Simulating Root Systems,		
W73-04271	2I	
ROUGHNESS (HYDRAULIC)		
Shape Effects on Resistance in Flood-Plain Channels,		
W73-04213	8B	
Hydraulic Roughness of Ice Covers,		
W73-04218	2C	
Roughness in a Model of Overland Flow,		
W73-04508	8B	
ROUTING		
Unit-Response Method of Open-Channel Flow Routing,		
W73-04215	8B	
RUNOFF		
A Reconnaissance of the Winyah Bay Estuarine Zone, South Carolina,		
W73-04095	7C	
Investigation and Calculation of Components in the Hydrologic Regime of Rivers (Issledovaniya i raschety elementov gidrologicheskogo rezhima rek).		
W73-04111	2E	
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego poloved'ya malykh vodotokov Ukrayini i Moldavii),		
W73-04116	2E	
Effect of Underlying Formations on Annual Runoff in Lowlands of the Dniester River Basin (Vliyanie na godovoy stok osobennostey podstiliayushchey poverkhnosty ravninnoy chasti basseyna Dnestr'a),		
W73-04117	2E	
RUNOFF COEFFICIENT		
Effect of Underlying Formations on Annual Runoff in Lowlands of the Dniester River Basin (Vliyanie na godovoy stok osobennostey podstiliayushchey poverkhnosty ravninnoy chasti basseyna Dnestr'a),		
W73-04117	2E	
RUNOFF FORECASTING		
Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries,		
W73-04063	4A	
Rainfall and Runoff in Urban Areas: Theory and Prediction,		
W73-04357	4C	
Using Canonical Correlation for Hydrological Predictions,		
W73-04381	2E	
An Index of Flood-Producing Rainfall Based on Rainfall and Soil Moisture Deficit,		
W73-04528	2A	
RUSTY GLACIER (CANADA)		
Survey of the Rusty Glacier Area, Yukon Territory, Canada, 1967-70,		
W73-03932	2C	
RUTHENIUM		
Observations of Radioruthenium and Radiocerium Isotopic Activity Ratios in Rain Water,		
W73-04313	5A	
RYE PATCH RESERVOIR (NEV)		
Bathymetric Reconnaissance of Rye Patch Reservoir and the Pitt-Taylor Reservoirs, Pershing County, Nevada,		
W73-04227	7C	
SAGITTA ELEGANS		
Yearly Respiration Rate and Estimated Energy Budget for <i>Sagitta elegans</i> ,		
W73-04400	5B	
SALINE SOILS		
Calculation of Electrical Conductivity From Solution Composition Data as an Aid to In-Situ Estimation of Soil Salinity,		
W73-03984	2G	
SALINE WATER INTRUSION		
A Reconnaissance of the Winyah Bay Estuarine Zone, South Carolina,		
W73-04095	7C	
A Report on the Prototype Data Collected in the Potomac River for the Chesapeake Bay Model Study,		
W73-04101	2L	
Nonuniform Groundwater-Conduit Discharge and Head Loss,		
W73-04362	2F	
SALINITY		
Salinity Problems in Arid Lands Irrigation: A Literature Review and Selected Bibliography,		
W73-03910	3C	
Calculation of Electrical Conductivity From Solution Composition Data as an Aid to In-Situ Estimation of Soil Salinity,		
W73-03984	2G	
Influence of Water Content on Electrical Conductivity of the Soil,		
W73-04093	2G	
Estimating Salinity of Streams in the Southwestern United States,		
W73-04198	4A	
Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico,		
W73-04241	5C	
Pollution Control in Sulphur Mining,		
W73-04498	5D	
SALINITY DATA		
Hydrographic Survey of the Galveston Bay System, Texas 1963-66,		
W73-04190	2L	
SALINIZED PLANTS		
Stomatal Conductance of Differentially Salinized Plants,		
W73-04181	3C	
SALMINE TREATMENT		
Concentration of Reovirus and Adenovirus From Sewage and Effluents by Protamine Sulfate (Salmine) Treatment,		
W73-03995	5D	
SALMON		
Effects of Acclimation and Acute Temperature Experience on the Swimming Speed of Juvenile Coho Salmon,		
W73-04243	5C	
Effects of Elevated Temperature of Juvenile Coho Salmon and Benthic Invertebrates in Model Stream Communities,		
W73-04545	5C	
SALMONELLA		
Efficiency of Salmonella Isolation from Meat-and-Bone Meal of One 300-g Sample Versus Ten 30-g Samples,		
W73-04247	5A	
SALMONELLA TYPHIMURIUM		
Evaluation of Herbicides for Possible Mutagenic Properties,		
W73-04233	5C	
SALMONELLAES		
Salmonellae as an Index of Pollution of Surface Waters,		
W73-04426	5A	
SALMONIDS		
Effects of Introductions of Salmonids into Barren Lakes,		
W73-04406	5C	
Loch Lomond: Man's Effects on the Salmonid Community,		
W73-04407	5C	
SALT MINES		
Radioactive Waste Repository Project; Annual Progress Report for Period Ending September 30, 1972,		
W73-04294	5B	
SALTS		
Salinity Problems in Arid Lands Irrigation: A Literature Review and Selected Bibliography,		
W73-03910	3C	
Reconditioning Brine to Cut Pollution,		
W73-04160	5D	
SAMPLE PREPARATION		
Raman Spectra-Structure Correlation for Pyrazines. New Method for Obtaining Spectra of Trapped Nanoliter Gas Chromatograph Fractions,		
W73-04388	5A	
SAMPLING		
Hydrographic Observations in Tampa Bay, Florida—1969,		
W73-03926	5A	
Red Sea Drillings,		
W73-04193	2J	
Efficiency of Salmonella Isolation from Meat-and-Bone Meal of One 300-g Sample Versus Ten 30-g Samples,		
W73-04247	5A	
A Sampling Scheme for Shallow Snowpacks,		
W73-04386	7B	
SAMPLING TECHNIQUES		
Salmonellae as an Index of Pollution of Surface Waters,		
W73-04426	5A	
SAND IMPOVERISHMENT		
Measurements of Movements of Solid Substances in Water by Means of Stable Tracers and Activation Analysis,		
W73-04490	5B	
SANDS		
Water Use Efficiency of Vegetable Crops Grown over Asphalt Moisture Barriers,		
W73-03902	3F	
Air Permeability as Related to Particle Size and Bulk Density in Sand System,		
W73-03972	2G	

SUBJECT INDEX

SANDSTONES

SANDSTONES	
Methods for the Calculation of True Formation Factors in the Bunter Sandstone of Northwest England,	
W73-04534	2F
SANDY LOAMS	
The Effect of Electrolyte Composition on Hydraulic Conductivity of Certain Texas Soils,	
W73-03986	2G
SANITATION DISTRICTS	
Waste Water Reuse-A Supplemental Supply,	
W73-03987	5D
SANITATION SYSTEM	
The Clivus Toilet - Sanitation Without Pollution,	
W73-04482	5G
SANTIAGO-DE-COMPOSTELA	
Evapotranspiration and Potential Evapotranspiration Measures in Santiago de Compostela (Spain),	
W73-04028	2D
SATELLITES (ARTIFICIAL)	
An Experimental Model for Automated Detection, Measurement and Quality Control of Sea-Surface Temperatures From ITOS-IR Data,	
W73-03940	7C
Sea Surface Temperature Mapping off the Eastern United States Using NASA's Itos Satellite,	
W73-03942	7B
SATURATED EXTRACT	
The Concentration of K, CA, and MG in the Saturation Extract in Relation to Exchangeable K, CA, and MG,	
W73-03970	2K
SATURATED FLOW	
Rapid Measurement of Hydraulic Conductivity Changes in Slowly Permeable Soils,	
W73-03968	2G
SCALE METER	
Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling,	
W73-04003	5D
SCALING	
Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling,	
W73-04003	5D
Cooling Water Treatment-Where Do We Stand,	
W73-04016	5D
Protective Measures for Cooling Systems in Keeping with Water Quality Standards,	
W73-04018	5D
Inhibiting Water Formed Deposits with Threshold Compositions,	
W73-04166	5D
SCANDIUM	
Evaluation of Treatment Plants by Tracer Methods. Annual Report, Jan. 1971-Jan. 1972,	
W73-04297	5B
SCHAFFER'S PROCEDURE	
Modification of Schaefer's Procedure for Serotyping of Organisms of the Mycobacterium-M. Intracellulare-M. Scrofulaceum Complex,	
W73-04398	5A

SCHWALM RIVER BASIN (BEL)	
Concerning Conservation of the Hoge Mark Forest Massif and of the High Valleys of the Schwalm and Its Tributaries at Elsenborn,	
W73-04523	6G
SCOUR	
Evaluation of Flared Outlet Transitions,	
W73-04196	8B
SEA ICE	
Remote Sensing of the Arctic Ice Environment,	
W73-03938	7B
Determination of Sea Ice Drift Using Side-Looking Airborne Radar,	
W73-03951	7B
SEA WALLS	
Forces Exerted by Waves Breaking Seaward of a Vertical Seawall,	
W73-03925	8B
SEA WATER	
Behavior of CS-137 and CE-144 in the Sorption System Sea Water-Sediment,	
W73-04324	5A
SEAFOOD WASTES	
Pollution Control Briefs.	
W73-03998	5D
SEASONAL	
The Possibility of Objective Control of Soil Moisture Data (In Russian),	
W73-04180	2G
Seasonal Sediment Yield Patterns of U.S. Rivers,	
W73-04205	2J
SEASONAL TREE GROWTH	
Characteristics of the Seasonal Growth of Trees in the Light of Dendrochronological and Dendroclimatological Studies (In Russian),	
W73-04344	2I
SECOND PRODUCTIVITY	
Yearly Respiration Rate and Estimated Energy Budget for <i>Sagitta elegans</i> ,	
W73-04400	5B
SEDIHYDROGRAMS	
Seasonal Sediment Yield Patterns of U.S. Rivers,	
W73-04205	2J
SEDIMENT CONTROL	
Urban Erosion-Practical Alternatives,	
W73-04359	4D
SEDIMENT DISCHARGE	
Fluvial-Sediment Discharge to the Oceans from the Conterminous United States,	
W73-04526	2J
SEDIMENT DISTRIBUTION	
Depositional Patterns, Facies, and Trace Element Accumulation in the Waubgan Member of the Late Pleistocene Lake Michigan Formation in Southern Lake Michigan,	
W73-04361	2J
SEDIMENT TRANSPORT	
Movement of Water in Glaciers,	
W73-03936	2C
Bagnold Approach and Bed-Form Development,	
W73-04217	8B
Statistical Properties of Missouri River Bed Forms,	
W73-04365	8B
SEDIMENT YIELD	
Seasonal Sediment Yield Patterns of U.S. Rivers,	
W73-04205	2J
Erosion Sediment Production,	
W73-04358	2J
Fluvial-Sediment Discharge to the Oceans from the Conterminous United States,	
W73-04526	2J
The Output of a Lowland Catchment,	
W73-04533	3B
SEDIMENTARY STRUCTURES	
Bagnold Approach and Bed-Form Development,	
W73-04217	8B
Statistical Properties of Missouri River Bed Forms,	
W73-04365	8B
SEDIMENTATION	
Researches on Removal of Colloidal Matter From Waste Water Produced in Sanitary Porcelain Ware and Ceramic Industry,	
W73-03990	5D
Treatment of Sewage,	
W73-04139	5D
Overbank Sedimentation in the Delaware River Valley During the Last 6000 Years,	
W73-04194	2J
The Sediments and Sedimentary Processes of the Holocene Tidal Flat Complex, Delmarva Peninsula, Virginia,	
W73-04360	2L
Use of Fallout Cesium-137 as a Tracer to Define the Recent Deltaic Facies of a River,	
W73-04501	2J
Sedimentation-Annotated Bibliography of Foreign Literature for 1969 and 1970, Survey No 7,	
W73-04507	2J
Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniyu moreiskikh beregov. 13-21 sentyabrya 1971 g. Palanga-Nida. Tezisy dokladov),	
W73-04514	2J
New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin (Novyye dannyye o diatomovykh vodoroslyakh otlozhennii boreal'noy transgressii v basseyne r. Vagi),	
W73-04517	2J
SEDIMENTOLOGY	
Recent Sediments of the Central California Continental Shelf, Pigeon Point to Sand Hills Bluffs: Part B. Mineralogical Data,	
W73-03922	2J
Sedimentation on Shell Banks in Delaware Bay,	
W73-04226	2L

SUBJECT INDEX

228A800 SHEET FLOW

THE SEDIMENTS AND SEDIMENTARY PROCESSES OF THE HOLOCENE TIDAL FLAT COMPLEX, DELMARVA PENINSULA, VIRGINIA,		
W73-04360	2L	
DEPOSITIONAL PATTERNS, FACIES, AND TRACE ELEMENT ACCUMULATION IN THE WAUKEGAN MEMBER OF THE LATE PLEISTOCENE LAKE MICHIGAN FORMATION IN SOUTHERN LAKE MICHIGAN,		
W73-04361	2J	
SEDIMENTS		
Particle Size of Mudflows on Carpathian Rivers in the Ukraine (Granulometricheskiy sostav silevyykh otlozheniy na rekakh Ukrainskikh Karpat),		
W73-04119	2E	
Environmental Chemistry: Grand River Studies,		
W73-04305	5B	
Characterization of the Sediments from the Tura and Sabana River Estuaries,		
W73-04308	5C	
Photochemical Degradation of Sediment Organic Matter: Effect on ZN65 Release,		
W73-04319	5B	
Behavior of CS-137 and CE-144 in the Sorption System Sea Water-Sediment,		
W73-04324	5A	
Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniyu morskikh beregov. 13-21 sentyabrya 1971 g. Palanga-Nida. Tezisy dokladov),		
W73-04514	2J	
SEEDS (WATER UPTAKE)		
Investigations on the Water Uptake of Cracking and Noncracking Cotyledons of Bean Seeds (Phaseolus vulgaris L.) (In German),		
W73-04301	3F	
SEEPAGE		
Earth and Earth-Rock Dams,		
W73-04074	8D	
Method and Apparatus for Controlling Substant Oil Seepage,		
W73-04128	5G	
Seepage From Shallow Reservoir,		
W73-04221	4A	
SEEPAGE CONTROL		
Method and Apparatus for Controlling Substant Oil Seepage,		
W73-04128	5G	
SELENIUM		
Selenium Accumulation in Soils and It's Absorption by Plants and Animals,		
W73-04272	5C	
Activation Analysis Trace-Element Studies to Marine Biological Samples,		
W73-04327	5A	
SENSORS		
New Sensors for the Automatic Sorting of Municipal Solid Waste,		
W73-04279	5D	
SEPARATION TECHNIQUES		
Recover Salable Products from Waste Yeast,		
W73-04014	5D	
Process and System for Control of Fluids in Water Disposal Surge Tanks,		
W73-04148	SD	
New Sensors for the Automatic Sorting of Municipal Solid Waste,		
W73-04279	SD	
Photochemical Degradation of Sediment Organic Matter: Effect on ZN65 Release,		
W73-04319	5B	
Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters,		
W73-04390	5F	
Rapid Separation of Metal Chelates by Column Liquid-Liquid Chromatography using Ultraviolet Detection,		
W73-04391	5A	
Analysis for Crude Fatty Acids (Total Fatty Acids and Unsaponifiable Matter) in Feed Grade Fats: Report of the Joint AOAC-AOCS Committee on the Analysis of Feed Grade Fats,		
W73-04397	5A	
Extraction of Anions into Chloroform by Surfactant Cations. Relevance to Dye Extraction Method of Analysis of Long Chain Amines,		
W73-04408	5A	
Separation of Activated Sludge from Mixed Liquor Using a Continuous Centrifuge,		
W73-04431	SD	
Sludge Dewatering Tests with a Belt Press,		
W73-04432	SD	
Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters,		
W73-04478	SD	
SEPTIC TANKS		
Reduces BOD 99%...At Low Cost,		
W73-04001	SD	
SEROTYPING		
Modification of Schaefer's Procedure for Serotyping of Organisms of the Mycobacterium-M. Intracellulare-M. Scrofulaceum Complex,		
W73-04398	5A	
SETTLED WASTES		
Effect of Turbulence on BOD Testing,		
W73-04443	SD	
SETTLEMENT (STRUCTURAL)		
Movements in Dams Due to Reservoir Filling,		
W73-04073	8D	
SETTLING BASINS		
Reduces BOD 99%...At Low Cost,		
W73-04001	SD	
Pond Cleaning Cost Cut 50 Percent by Auger-Equipped Barge.		
W73-04004	5G	
SETTLING VELOCITY		
Method and Apparatus for Clarifying Liquids,		
W73-04152	SD	
The Optimum Flocculant Concentration for Effective Flocculation of China Clay in Aqueous Suspension,		
W73-04477	SD	
SEWERS		
Sewer Service Gamble Worth \$120,000,		
W73-04434	5G	
SHALLOW SNOWPACKS		
A Sampling Scheme for Shallow Snowpacks,		
W73-04386	7B	
SHEAR STRESS		
Shape Effects on Resistance in Flood-Plain Channels,		
W73-04213	8B	
SHEET FLOW		
Sheet Flow Under Simulated Rainfall,		
W73-03921	2B	

SUBJECT INDEX

SHELLFISH-BORNE DISEASES

SHELLFISH-BORNE DISEASES
A Shellfish-Borne Cholera Outbreak in Malaysia,
W73-04182 5C

SHORE PROCESSES

Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniyu morskikh beregov, 13-21 sentyabrya 1971 g. Palanga-Nida. Tez issy doklazov),
W73-04514 2J

SHORE PROTECTION

Forces Exerted by Waves Breaking Seaward of a Vertical Seawall,
W73-03925 8B

Floatable Breakwater Element,
W73-04153 8A

Regional Inventory Report-South Atlantic-Gulf Region, Puerto Rico and the Virgin Islands.
W73-04228 8B

Tybee Island, Georgia; Galveston Harbor, Texas.
W73-04452 6E

SHORES

Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniyu morskikh beregov, 13-21 sentyabrya 1971 g. Palanga-Nida. Tez issy doklazov),
W73-04514 2J

SICILY

Measurements of Movements of Solid Substances in Water by Means of Stable Tracers and Activation Analysis,
W73-04490 5B

SIGNAL-NOISE RATIOS

Some Comments on the Signal-to-Noise Characteristics of Real Photomultiplier and Photodiode Detection Systems,
W73-04419 7B

SILICA

Iron and Silica in Water, Acid Ammonium Oxalate, and Dithionite Extracts of Some North Carolina Coastal Plain Soils,
W73-04088 2G

SILVER CARP

Propagation of Grass Carp and Silver Carp, (In Korean),
W73-04261 8I

SIMULATION ANALYSIS

Potential Thermal Effects of an Expanding Power Industry: Columbia River Basin,
W73-04024 5C

Learning, External Benefits, and Subsidies in Water Desalination,
W73-04274 6B

Combined use of Optimization and Simulation Models in River Basin Planning,
W73-04275 6A

Flexible Pricing in Water Supply Planning--For Flexible Engineers,
W73-04354 6A

SIROTHERM PROCESS

Australian Sirotherm Process Removes Salt from Brackish Water,
W73-04285 5F

SITE SELECTION

Logical Approaches to Power Supply and Environment,
W73-04036 5G

Environmental Aspects of High Voltage Substations,
W73-04080 8C

SITES

Siting A Thermal Multi-Purpose Energy Center,
W73-04021 5C

SITING

Siting A Thermal Multi-Purpose Energy Center,
W73-04021 5C

SKIMMING

Method and Apparatus for Clarifying Liquids,
W73-04152 5D

SLOPE PROFILES

Some Features of the Mountain Steppe Soils of Trans-Ili and Dzhungarian Ala-Tau in Connection with Erosion (In Russian),
W73-04281 2G

SLOPE STABILITY

Influence of Progressive Failure on Slope Stability,
W73-04366 8D

SLOWLY PERMEABLE SOILS

Rapid Measurement of Hydraulic Conductivity Changes in Slowly Permeable Soils,
W73-03968 2G

SLUDGE DIGESTION

Experiences with the Sludge Program in the Denver Area,
W73-04286 5D

SLUDGE DISPOSAL

Pond Cleaning Cost Cut 50 Percent by Auger-Equipped Barge.
W73-04004 5G

Industrial Waste Can Be An Asset.

W73-04280 5D

Experiences with the Sludge Program in the Denver Area,
W73-04286 5D

Sludge Dewatering Tests with a Belt Press,

W73-04432 5D

Sludge Disposal-My Problem and Its Solution: A Symposium.
W73-04451 5D

SLUDGE RECYCLING

Experiences with the Sludge Program in the Denver Area,
W73-04286 5D

SLUDGE TREATMENT

Studies on Purification Theories and Mechanism of Activated Sludge. (IV) Application of Purification Theories to the Activated Sludge Process,
W73-03994 5D

Liquid and Sludge Treatment,

W73-04143 5D

Control of the Anaerobic Digestion Process and Supporting Unit Processes,
W73-04430 5D

Separation of Activated Sludge from Mixed Liquor Using a Continuous Centrifuge,
W73-04431 5D

Sludge Dewatering Tests with a Belt Press,
W73-04432 5D

Studies on the Design Data of Gravity Thickening,
W73-04433 5D

Andover Sewage-Treatment Works,
W73-04439 5D

SMALL WATERSHEDS

Investigation of Storm Runoff on Small Watersheds in Lowlands of the Ukraine (Issledovaniye poter' dozhddevogo stoka na malykh vodosobrazh ravninnoy territorii Ukrayiny),
W73-04113 2E

The Output of a Lowland Catchment,
W73-04533 3B

The Ohio State University Version of the Stanford Streamflow Simulation Model: Part I - Technical Aspects,
W73-04542 2A

The Ohio State University Version of the Stanford Streamflow Simulation Model: Part II - The Computer Program,
W73-04543 2A

The Ohio State University Version of the Stanford Streamflow Simulation Model: Part III - User's Manual,
W73-04544 2A

SNAKE RIVER

A Dynamic Programming Study of Various Diversion Losses,
W73-04068 4A

SNOW

Chemical Composition of Atmospheric Precipitation in the Deputatskiy Region (Khimicheskij sostav atmosfernnykh osadkov, vypadayushchikh na territorii Deputatskogo rayona),
W73-04511 2B

SNOW COVER

Radio Cross-Section Measurements of Snow and Ice,
W73-03920 2C

SNOW SURVEYS

Radio Cross-Section Measurements of Snow and Ice,
W73-03920 2C

SNOWPACKS

Finite-Element Stress Analysis of Avalanche Snowpacks,
W73-03928 2C

A Sampling Scheme for Shallow Snowpacks,
W73-04386 7B

SOCIAL PARTICIPATION

Eden Preserved,
W73-04466 5G

SOCIOECONOMIC INDEX

A Survey of Attitudes Towards the Mississippi River as a Total Resource in Minnesota,
W73-03905 6B

SUBJECT INDEX

SOIL PHYSICS

SOCKEYE SALMON			
Limnology and Fish Ecology of Sockeye Salmon Nursery Lakes of the World, W73-04405	5C		
SODIUM			
Soil Hydraulic Conductivity and Bulk Volume Changes During Cyclic Calcium-Sodium Exchange, W73-03965	2K		
The Effect of Electrolyte Composition on Hydraulic Conductivity of Certain Texas Soils, W73-03986	2G		
SODIUM COMPOUNDS			
Inline Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment, W73-04161	5D		
SODIUM TREATED CATCHMENTS			
Development of Economic Water Harvest Systems for Increasing Water Supply - Phase II, W73-03901	3B		
SOIL AIR DISPLACEMENT			
Soil Air Pressure and Water Infiltration Under Border Irrigation, W73-04087	2G		
SOIL AIR PRESSURE			
Soil Air Pressure and Water Infiltration Under Border Irrigation, W73-04087	2G		
SOIL CHEMICAL PROPERTIES			
Calculation of Electrical Conductivity From Solution Composition Data as an Aid to In-Situ Estimation of Soil Salinity, W73-03984	2G		
Selenium Accumulation in Soils and It's Absorption by Plants and Animals, W73-04272	5C		
SOIL CHEMISTRY			
Isotopic Exchange Studies of Micronutrients in Soils, W73-03963	2G		
Soil Hydraulic Conductivity and Bulk Volume Changes During Cyclic Calcium-Sodium Exchange, W73-03965	2K		
The Concentration of K, CA, and MG in the Saturation Extract in Relation to Exchangeable K, CA, and MG, W73-03970	2K		
Anion Exclusion Effects on Chloride Movement in Soils, W73-03973	2K		
Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils, W73-03974	5B		
Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils, W73-03983	2K		
The Effect of Electrolyte Composition on Hydraulic Conductivity of Certain Texas Soils, W73-03986	2G		
Iron and Silica in Water, Acid Ammonium Oxalate, and Dithionite Extracts of Some North Carolina Coastal Plain Soils, W73-04088	2G		
SOIL COMPACTION			
Topsoil Reaction to Mechanical Pressure, W73-04057	2G		
SOIL CONTAMINATION			
Environmental Surveillance at Hanford for CY-1971, W73-04310	5A		
SOIL DENSITY PROBES			
Relation Between Energy and Error Due to Nuclear Statistics for Density Measurement by Gamma Ray Transmission, W73-03964	8D		
SOIL DROUGHT			
Soil Moisture Pressure and Relative Transpiration of Plants in the Case of Soil Drought (In Russian), W73-04524	2D		
SOIL EROSION			
Contribution to Methods of Applied Investigations of Soil Erosion on the Right Bank of the Volga in the Gorki Region, (In Russian), W73-04053	2J		
SOIL FERTILITY			
Isotopic Exchange Studies of Micronutrients in Soils, W73-03963	2G		
SOIL FUNGI			
Effects of Various Soil Fungi and Insecticides on the Capacity of <i>Mucor alternans</i> to Degrade DDT, W73-04232	5B		
SOIL INVESTIGATION			
Performance of a Frost-Tube for Determination of Soil Freezing and Thawing Depths, W73-04254	7B		
SOIL MANAGEMENT			
Isotopic Exchange Studies of Micronutrients in Soils, W73-03963	2G		
Soil Hydraulic Conductivity and Bulk Volume Changes During Cyclic Calcium-Sodium Exchange, W73-03965	2K		
SOIL MECHANICS			
Hydrostatics in Swelling Soils and Soil Suspensions: Unification of Concepts, W73-03982	8D		
Influence of Progressive Failure on Slope Stability, W73-04366	8D		
Lateral Pressures From Soft Clay, W73-04367	8D		
SOIL MOISTURE			
Electromagnetic Pulse Sounding for Surveying Underground Water, W73-03912	7B		
Use of Information on the Agrohydrological Properties of Soil in the Computation of Moisture Reserves in Farm Fields, (In Russian), W73-03917	3F		
Measurement of Unsaturated Conductivity and Diffusivity by Infiltration Through an Impeding Layer, W73-03971	2G		
SOIL PHYSICS			
Non-Linear Thermodynamics of Soil-Water-Heat Systems, W73-03960	2G		
Thermodynamics of Soil-Water System, W73-03961	2G		

SUBJECT INDEX

SOIL PROFILES

SOIL PROFILES
Transient Infiltration into Crust-Topped Profiles, W73-03976 2G

Determination of a Water Table in a Soil Profile Using the Platinum Oxygen Cathode, W73-03985 2G

SOIL PROPERTIES

Water Absorption by Wheat Seeds as Influenced by Hydraulic Properties of Soil, W73-04172 3F

SOIL RECLAMATION

Sprinkling and Ponding Techniques for Reclaiming Saline Soils, W73-04081 3F

SOIL SURFACES

Dynamics of the Soil-Water System During a Rainstorm, W73-04107 2G

SOIL SUSPENSIONS

Hydrostatics in Swelling Soils and Soil Suspensions: Unification of Concepts, W73-03982 8D

SOIL TEXTURE

Effect of Soil Texture on Evaporative Loss and Available Water in Semi-Arid Climates, W73-03952 2D

SOIL TREATMENT

Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils, W73-03974 5B

SOIL WATER

Water Use Efficiency of Vegetable Crops Grown over Asphalt Moisture Barriers, W73-03902 3F

Non-Linear Thermodynamics of Soil-Water-Heat Systems, W73-03960 2G

Thermodynamics of Soil-Water System, W73-03961 2G

Influence of Water Content on Electrical Conductivity of the Soil, W73-04093 2G

SOIL-WATER-HEAT SYSTEMS

Non-Linear Thermodynamics of Soil-Water-Heat Systems, W73-03960 2G

Thermodynamics of Soil-Water System, W73-03961 2G

SOIL WATER MOVEMENT

Transient Infiltration into Crust-Topped Profiles, W73-03976 2G

Soil Air Pressure and Water Infiltration Under Border Irrigation, W73-04087 2G

Water Movement in Undisturbed Swelling Clay Soil, W73-04089 2G

Solutions for Miscible Displacement of Soil Water with Time-Dependent Velocity and Dispersion Coefficients, W73-04090 2G

The Numerical Analysis of Infiltration Into Heterogeneous Porous Media, W73-04091 2G

Horizontal Infiltration into Layered Soils, W73-04092 2G

The Changeability of the Hydraulic Conductivity of Saturated Soil Samples, W73-04108 2G

Steady-State Evaporation Through Non-Homogeneous Soils From a Shallow Water Table, W73-04110 2D

Absorption of Water by a Soil from a Circular Cylindrical Source, W73-04200 5B

The Infiltration Envelope: Results From a Theoretical Infiltrometer, W73-04376 2G

The Lateral Inflow into Submerged Drains, W73-04384 8B

SOIL-WATER-PLANT-RELATIONSHIPS

Effects of Soil Texture on Evaporative Loss and Available Water in Semi-Arid Climates, W73-03952 2D

Factors Affecting Plant Uptake and Phytotoxicity of Cadmium Added to Soils, W73-04058 5B

Flow of Water into Ceramic Tubes Simulating Root Systems, W73-04271 2I

SOILS
Nature of Soils and Patterns of Their Distribution in the Kyra District, Chita Region, (In Russian), W73-03977 2G

Investigation of the Possibility of Artificial Control of the Rate of Evaporation from Soils (In Russian), W73-04013 2D

Effect of Nitrogen Source on Corn and Bromegrass Production, Soil pH, and Inorganic Soil Nitrogen, W73-04173 3F

A Study of Erosion Resistance of Soils on the Northern Slopes of Trans-Ili Ala-Tau and the Ketmen Range (In Russian), W73-04179 2J

SOLID WASTES
Pond Cleaning Cost Cut 50 Percent by Auger-Equipped Barge, W73-04004 5G

Handling and Disposal of Chemical Wastes, W73-04008 5D

New Sensors for the Automatic Sorting of Municipal Solid Waste, W73-04279 5D

SOLVENT EXTRACTIONS

Analysis for Crude Fatty Acids (Total Fatty Acids and Unsaponifiable Matter) in Feed Grade Fats: Report of the Joint AOAC-AOCS Committee on the Analysis of Feed Grade Fats, W73-04397 5A

Combined Ion Exchange-Solvent Extraction (Ciese) Studies of Metal Ions on Ion Exchange Papers, W73-04414 5A

SORPTION

Behavior of CS-137 and CE-144 in the Sorption System Sea Water-Sediment, W73-04324 5A

SORTING

Automatic Sorting of Infrared Spectra, W73-04413 7C

SOURCES OF ERROR

Sources of Error and Confirmation in the Determination of Methylmercury Radicals, W73-04050 5A

SOUTH AFRICA

Our Mangroves Threatened, W73-04263 2I

SOUTH AMERICA

The Pleistocene Moraine Stages of West-Central Peru, W73-03931 2C

SOUTH CAROLINA

A Reconnaissance of the Winyah Bay Estuarine Zone, South Carolina, W73-04095 7C

Award Winning Water Treatment Plant Features Automation, W73-04447 5D

Murrells Inlet, South Carolina: Northport Harbor, Wisconsin, W73-04453 6E

SOUTH DAKOTA

Ecological Factors Influencing Production of Algae in Northern Prairie Lakes, W73-03909 5C

SOUTH PLATTE RIVER VALLEY (COLO)

Ground-Water Levels in the South Platte River Valley of Colorado, 1968-72, W73-04211 7C

SOUTHEAST ASIA

Some Generalized Characteristics of the Floods and Droughts of the Lower Mekong, W73-04380 2E

SOUTHEAST U.S.

Regional Inventory Report-South Atlantic-Gulf Region, Puerto Rico and the Virgin Islands, W73-04228 8B

SOUTHWEST U.S.

Estimating Salinity of Streams in the Southwestern United States, W73-04198 4A

SOUTHWEST US

Quality of Surface Waters of the United States, 1967: Parts 9-11. Colorado River Basin to Pacific Slope Basins in California, W73-03924 7C

SOYBEAN D

Accessibility of Amino Acids in Artificial Food To Pond Fish: III. Accessibility of Amino Acids in Soybean Meal, Castor Oil Cakes, Wheat and Food Mixes to Yearling Carp (In Russian), W73-04309 8I

SUBJECT INDEX

STOCHASTIC PROCESSES

SPAIN			
Evapotranspiration and Potential Evapotranspiration Measures in Santiago de Compostela (Spain), W73-04028	2D		
SPECIES DIVERSITY			
Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico, W73-04241	5C		
SPECIFIC CAPACITY			
An Attempt at Estimating the Transmissibilities of Trappean Aquifers from Specific Capacity Values, W73-04527	2F		
SPECTRAL ANALYSIS			
Computer-Aided Visual Spectrum Analysis, W73-04234	5A		
SPECTRAL DATA SOURCES			
Survey of Analytical Spectral Data Sources and Related Data Compilation Activities, W73-04244	5A		
SPECTROPHOTOMETRY			
Extraction of Anions into Chloroform by Surfactant Cations. Relevance to Dye Extraction Method of Analysis of Long Chain Amines, W73-04408	5A		
Vanadium Determination in Biological Materials at Nanogram Levels by a Catalytic Method, W73-04409	5A		
SPECTROSCOPY			
Survey of Analytical Spectral Data Sources and Related Data Compilation Activities, W73-04244	5A		
SPENDING PRIORITIES			
A Survey of Attitudes Towards the Mississippi River as a Total Resource in Minnesota, W73-03905	6B		
SPILLWAY GATES			
Pertinent Data on Spillway Tainter Gates for Corps of Engineers Projects, W73-04377	8C		
SPILLWAYS			
N Sub 2-Threat to Pacific Northwest Fisheries, W73-04075	8I		
SPOONER LAKE (NEV)			
Bathymetric Reconnaissance of Marlette and Spooner Lakes, Washoe County and Carson City, Nevada, W73-04100	7C		
SPREAD PLATES			
An Evaluation of Procedures for Enumerating Bacteria in Activated Sludge, W73-04450	5A		
SPRING			
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego polovod'ya malykh vodotokov Ukrayini i Moldavii), W73-04116	2E		
SPRING WATERS			
The Chemical History of Some Spring Waters in Carbonate Rocks, W73-03959	5B		
SPRINGFIELD (MASS)			
Direct Filtration an Economic Answer to Water Treatment Needs, W73-04446	5D		
SPRINKLER IRRIGATION			
Center Pivot Irrigation, W73-03978	3F		
SPRINKLERS			
Sprinkler use for Swine Cooling, W73-04266	3E		
SPRINKLING			
Sprinkling and Ponding Techniques for Reclaiming Saline Soils, W73-04081	3F		
ST. JOSEPH RIVER (MICH)			
Use of Fallout Cesium-137 as a Tracer to Define the Recent Deltaic Facies of a River, W73-04501	2J		
ST. LAWRENCE RIVER			
The Clay Mineralogy and Some Properties of Bottom Sediments of the St. Lawrence River Near Kingston, Ontario, W73-04538	2J		
STABILIZATION PONDS			
3-Stage Ponds Earn Plaudits, W73-04438	5D		
STABLE ISOTOPES			
Evaluation of Treatment Plants by Tracer Methods. Annual Report, Jan. 1971-Jan. 1972, W73-04297	5B		
STAGE-DISCHARGE RELATIONS			
Transient Analysis of the Detroit River by the Implicit Method, W73-04207	2E		
Estimating Discharge from Superelevation in Bends, W73-04219	8B		
A Comparison of Morphometric Measures of Bankfull, W73-04375	2E		
STANDARDS			
Higher Standards: The Local Authorities View, W73-04492	5F		
Effluent Standards From the Viewpoint of the Industrialist, W73-04493	5G		
STANFORD STREAMFLOW MODEL			
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part I - Technical Aspects, W73-04542	2A		
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part II - The Computer Program, W73-04543	2A		
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part III - User's Manual, W73-04544	2A		
STATISTICAL ANALYSIS			
Sheet Flow Under Simulated Rainfall, W73-03921	2B		
STATISTICAL METHODS			
Selection of Test Variable for Minimal Time Detection of Basin Response to Natural or Induced Changes, W73-04061	4A		
Comparison of Multiple Regression and Principal Component Regression for Predicting Water Yields in Kentucky, W73-04199	4A		
Quantitative Characterization of Channel Network Structure, W73-04204	8B		
Analysis of Turbidite Correlation in Cascadia Basin, Northeast Pacific Ocean, W73-04249	5B		
Principle of Maximum Entropy in Hydrologic Frequency Analysis, W73-04531	7C		
STATISTICAL MODELS			
Estimating Salinity of Streams in the Southwestern United States, W73-04198	4A		
STATISTICS			
Hurst Phenomenon in Turbulence, W73-04206	2E		
Mariculture in Japan Using Heated Effluent Water, W73-04340	5G		
STEADY FLOW			
Unified Nondimensional Formulation for Open Channel Flow, W73-04223	8B		
Simple Waves on Shear Flows: Similarity Solutions, W73-04539	2E		
The Interaction of Large Amplitude Shallow-Water Waves With an Ambient Shear Flow: Non-Critical Flows, W73-04540	2E		
STEAM TURBINES			
Combined Steam Power Plant and Water Distillation System, W73-04140	3A		
STEAMING			
Evaluation of Size of Organic Substance Losses During Steaming of Natural Waters (In Russian), W73-04521	5G		
STEPPE SOILS			
Mountain Meadow Steppe Soils of the Chatkal Range (In Russian), W73-04164	2G		
Some Features of the Mountain Steppe Soils of Trans-Ili and Dzhungarian Alas-Tau in Connection with Erosion (In Russian), W73-04281	2G		
STOCHASTIC PROCESSES			
Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries, W73-04063	4A		
Stochastic Structure of Water Use Time Series, W73-04098	4A		
On the Time When the Extreme Flood Occurs, W73-04210	2E		

SUBJECT INDEX

STOMATAL CONDUCTANCE

STOMATAL CONDUCTANCE
Stomatal Conductance of Differentially
Salinized Plants,
W73-04181 3C

STONE-WARE

Researches on Removal of Colloidal Matter
From Waste Water Produced in Sanitary Por-
celain Ware and Ceramic Industry,
W73-03990 5D

STORM DRAINS

Evaluation of Flared Outlet Transitions,
W73-04196 8B

STORM RUNOFF

Investigation of Storm Runoff on Small
Watersheds in Lowlands of the Ukraine (Iss-
ledovaniye poter' dozhdevogo stoka na malykh
vodospobakh ravinnoy territorii Ukrayiny),
W73-04113 2E

Effect of Karst on Floods on Left-Bank Tribu-
taries of the Dniester River (Vlyaniye karsta
na formirovaniye livneykh pavodkov na
levoberezhnykh pritokakh Dnestra),
W73-04114 2E

STORMS

Calculations of Maximum Flood Discharges on
Mountain Streams in the Crimea (Raschety
maksimal'nykh raskhodov vody dozhdevykh
pavodkov na gornykh rekakh Kryma),
W73-04115 2E

STRATIFIED SOIL COLUMN

A Computer Analysis on the Leaching of
Boron From Stratified Soil Columns,
W73-03967 2G

STREAM FLOW

Predicting Effects of Dead Zones on Stream
Mixing,
W73-04288 5B

STREAM ORDER PREDICTIONS

A New Topological Relationship as an Indica-
tor of Drainage Network Evolution,
W73-04203 4A

STREAMFLOW

Water Pressure in Intra- and Subglacial Chan-
nels,
W73-03927 2C

Investigation and Calculation of Components in
the Hydrologic Regime of Rivers (Iss-
ledovaniye i raschet elementov
gidrologicheskogo rezhima rek).
W73-04111 2E

Minimum Streamflow in Northwest Ukraine
(Osobennosti formirovaniya minimal'nogo
stoka rek Severo-Zapada Ukrayiny),
W73-04118 2E

Estimating Salinity of Streams in the
Southwestern United States,
W73-04198 4A

Flood of September 20-23, 1969, in the Gad-
den County Area, Florida,
W73-04535 2E

STREAMFLOW FORECASTING

Transient Analysis of the Detroit River by the
Implicit Method,
W73-04207 2E

The Ohio State University Version of the Stan-
ford Streamflow Simulation Model: Part I -
Technical Aspects,
W73-04542 2A

The Ohio State University Version of the Stan-
ford Streamflow Simulation Model: Part II -
The Computer Program,
W73-04543 2A

The Ohio State University Version of the Stan-
ford Streamflow Simulation Model: Part III -
User's Manual,
W73-04544 2A

STREAMS

Gazetteer of Natural Drainage Areas of
Streams and Water Bodies within the State of
Connecticut,
W73-03914 7C

Calculations of Maximum Flood Discharges on
Mountain Streams in the Crimea (Raschety
maksimal'nykh raskhodov vody dozhdevykh
pavodkov na gornykh rekakh Kryma),
W73-04115 2E

Spring-Flood Runoff From Small Watercourses
in the Ukraine and Moldavia (Ob'yemy stoka
vesennego polovod'ya malykh vodotokov
Ukrainy i Moldavii),
W73-04116 2E

Effects of Elevated Temperature of Juvenile
Coho Salmon and Benthic Invertebrates in
Model Stream Communities,
W73-04545 5C

STREPTOCOCCUS

Improved Procedure for Identification of
Group D Enterococci with Two New Media,
W73-04253 5A

STRESS ANALYSIS

Finite-Element Stress Analysis of Avalanche
Snowpacks,
W73-03928 2C

STRIP MINES

Stream Faunal Recovery After Manganese
Strip Mine Reclamation,
W73-04546 5C

STRIPPING ANALYSIS

Influence of Amalgam Formation on Cyclic
Voltammetry,
W73-04410 5A

STRONTIUM

Shallow-Water Strontium-90 Anomaly About
the Antilles Arc-1970,
W73-04293 5B

STRONTIUM-90

Strontium-90 in the Great Lakes: Concentra-
tion-Time Model,
W73-04296 5A

FALLOUT PROGRAM

Quarterly Summary Report
June 1, 1972 - September 1, 1972 - An Appen-
dix,
W73-04316 5B

STRUCTURAL DESIGN

New Structural Designs for H. V. Transmission
Towers,
W73-04078 8C

STURGEON

Effect of Petroleum and Petroleum Products on
Sturgeon and Other Fish, (In Russian),
W73-04495 5C

SUBALPINE FORESTS

Water Shortage in the Forest Floor of Subal-
pine Forests of Alberta,
W73-04169 4A

SUBGLACIAL STREAMS

Water Pressure in Intra- and Subglacial Chan-
nels,
W73-03927 2C

Movement of Water in Glaciers,

W73-03936 2C

SUBLETHAL CONCENTRATIONS

The Uptake of Insecticides by Freshwater
Mussels and the Effects of Sublethal Concentra-
tions of Insecticides on These Mussels,
W73-03904 5C

SUBSIDIES

Learning, External Benefits, and Subsidies in
Water Desalination,
W73-04274 6B

SUBSTATIONS (ELECTRICAL)

Environmental Aspects of High Voltage Sub-
stations,
W73-04080 8C

SUBSTRATE CONCENTRATION

Control of Growth Rate by Initial Substrate
Concentration at Values Below Maximum
Rate,
W73-04499 5C

SUBSTRATE UTILIZATION

Flocculant Production from Kerosene,
W73-04245 5B

Study of the Metabolization of Pollutant
Products,
W73-04402 5B

SUBSTRATES

Kinetic Behavior of Mixed Populations of Ac-
tivated Sludge,
W73-04441 5D

SUBSURFACE WATERS

Summary of Panel on Carbon Isotopes in Sub-
surface Hydrology and the Role of Paleoclimate
in their Interpretation.
W73-03957 2F

SUCCESSION

Factors of Ecologic Succession in Oligotrophic
Fish Communities of the Laurentian Great
Lakes,
W73-04399 5C

SULFIDES

Pollution Control in Sulphur Mining,
W73-04498 5D

SULFUR BACTERIA

Microbiology of Water,
W73-04235 5B

SULFUR TREATMENTS

Effects of Irrigation, Manganese Sulphate and
Sulphur Applications on Common Scab of the
Potato,
W73-04167 5G

Common Potato Scab: Effects of Irrigation,
Manganese Sulphate and Sulphur Treatments
for Common Potato Scab on Mineral Composi-
tion of Plant Material and Soil Extracts,
W73-04168 5G

SULFUR WELL BLEEDWATER

Pollution Control in Sulphur Mining,
W73-04498 5D

SUBJECT INDEX

TERTIARY TREATMENT

SULPHIDES		
Tannery Effluents and Their Treatment - Part I, W73-04550	5D	
SULPHURIC ACID RECOVERY		
Waste Acid to be Recovered and Refused. W73-04015	5D	
SUN-SHADE ADAPTATION		
'Sun-Shade' Adaptation in Microbenthic Algae from the Oresund, W73-04519	5C	
SUPERITICAL FLOW		
Amplification Criterion of Gradually Varied, Single Peaked Waves, W73-04097	8B	
SUPERNATANT		
Separation of Activated Sludge from Mixed Liquor Using a Continuous Centrifuge, W73-04431	5D	
SUPERSATURATION		
N Sub 2-Threat to Pacific Northwest Fisheries, W73-04075	8I	
SURFACE IRRIGATION		
Optimal Design of Furrow Length of Surface Irrigation, W73-03975	3F	
SURFACE RUNOFF		
Non-Point Source Pollution From Agricultural, Rural, and Developing Areas. W73-04462	5B	
SURFACE WATERS		
Quality of Surface Waters of the United States, 1967: Parts 9-11. Colorado River Basin to Pacific Slope Basins in California. W73-03924	7C	
Water Resources of Union Parish, Louisiana, W73-04503	4B	
Water Resources of Ouachita Parish, Louisiana, W73-04504	4B	
SURFACES		
Photogrammetry and Hydraulic Surfaces, W73-04368	7B	
SURVEILLANCE PROGRAM		
Environmental Surveillance at Hanford for CY-1971, W73-04310	5A	
SURVEYS		
Irrigation Survey. W73-03980	3F	
Planning Concrete Dam Construction Control Surveys, W73-04077	8A	
Survey of Analytical Spectral Data Sources and Related Data Compilation Activities, W73-04244	5A	
Shallow-Water Strontium-90 Anomaly About the Antilles Arc-1970, W73-04293	5B	
Fallout Program. Quarterly Summary Report, June 1, 1972 Through Sept. 1, 1972, W73-04315	5B	
Radiological Surveillance at Pressurized Water Reactors, W73-04325	5B	
SUSPENDED SOLIDS		
Researches on Removal of Colloidal Matter From Waste Water Produced in Sanitary Porcelain Ware and Ceramic Industry, W73-03990	5D	
Measurement of Suspended Solids Concentrations in Sewage by use of a Depolarization Method, W73-04185	5A	
Techniques for the Characterization of suspended Sediment and Selected Applications for the Acquired Data, W73-04302	5B	
Measurements of Movements of Solid Substances in Water by Means of Stable Tracers and Activation Analysis, W73-04490	5B	
SWEDEN		
Birds Give Warning, W73-04049	5C	
Studies on Chemical, Physical an Biological Conditions in Swedish Rockpool Ecosystems, W73-04191	2H	
SWELLING		
Hydrostatics in Swelling Soils and Soil Suspensions: Unification of Concepts, W73-03982	8D	
SWIMMING		
Effects of Acclimation and Acute Temperature Experience on the Swimming Speed of Juvenile Coho Salmon, W73-04243	5C	
SWIMMING POOLS		
Ozone Active Carbon Treatment of Sea Water for Swimming Pools, (In German), W73-04411	5D	
SWINE COOLING		
Sprinkler use for Swine Cooling, W73-04266	3E	
SYMPOSIUM		
Air and Water Pollution. W73-04178	5G	
SYNTHETIC HYDROLOGY		
Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries, W73-04063	4A	
SYSTEMS ANALYSIS		
Optimal Design of Furrow Length of Surface Irrigation, W73-03975	3F	
TAGGED FISH		
An Electronic Detector System for Recovering Internally Tagged Menhaden, Genus Brevoortia, W73-04174	7B	
TAGGING		
Evaluation of Treatment Plants by Tracer Methods. Annual Report, Jan. 1971-Jan. 1972, W73-04297	5B	
Sources of Water Pollution Established by Using a Neutron Activatable Tracer, W73-04326	5B	
TAMPA BAY (FLA)		
Hydrographic Observations in Tampa Bay, Florida-1969, W73-03926	5A	
TERROLOGIC ASPECTS		
Hydrologic Aspects of Freshening Upper Old Tampa Bay, Florida, W73-04094	2H	
TANNERY WASTES		
Tannery Effluents and Their Treatment-Conclusion, W73-04488	5D	
TELEMETRY		
Field Measurement of Soil Water Potential With Thermocouple Psychrometers, W73-04105	2G	
TELEOST FISH		
Lampreys and Teleost Fish, Other than Whitebait, in the Polluted Thames Estuary, W73-04262	5C	
TEMPERATURE		
A Temperature-Induced Transition in Mitochondrial Oxidation: Contrasts Between Cold and Warm-Blooded Animals, W73-04027	5C	
Temperature Tolerance of Pathogenic and Non-pathogenic Free-Living Amoebas, W73-04330	5C	
Literature Search for Atmospheric Humidity Profile Models from the Sea Surface to 1,000 Meters, W73-04332	7C	
Use of Surface Observations in Boundary-Layer Analysis, W73-04333	7C	
Before and After Studies on the Effects of a Power Plant Installation on Lake LBJ - A Numerical Temperature Model for Lake LBJ, W73-04335	5B	
Conference on Beneficial Uses of Thermal Discharges. W73-04337	5G	
Biological Limitations on the Use of Waste Heat in Aquaculture, W73-04342	5G	
Measurements of Sea Surface Temperature on the Eastern Pacific Continental Shelf Using Airborne Infrared Radiometry, August 1963 - July 1968, W73-04352	7B	
High Sensitivity Thermochemical Analysis, W73-04420	7B	
TEN STATES FORMULA		
Performance of Deep Trickling Filters by Five Methods, W73-04486	5D	
TERRAE CORRELATION		
Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava), W73-04512	2J	
TERTIAL TREATMENT		
Water Pollution Control in Pulp and Paper Industry, W73-04424	5D	

SUBJECT INDEX

TESTING

TESTING	
Selection of Test Variable for Minimal Time Detection of Basin Response to Natural or Induced Changes, W73-04061	4A
TEXAS	
Reclamation and Industrial Reuse of Amarillo's Waste Water, W73-03988	5D
Reclaiming Cooling Tower Blowdown, W73-04040	5D
Buffalo Lake Recreational Water Quality: A Study in Bacteriological Data Interpretation, W73-04162	5B
Hydrographic Survey of the Galveston Bay System, Texas 1963-66, W73-04190	2L
Before and After Studies on the Effects of a Power Plant Installation on Lake LBJ - a Numerical Temperature Model for Lake LBJ, W73-04335	5B
Before and After Studies of the Effects of a Power Plant Installation on Lake LBJ - Measurement and Prediction of Abnormal Reservoir Operations on Lake LBJ's Water Quality, W73-04336	5B
Water Treatment Plant for Today and Tomorrow, W73-04435	5D
Texas Seashore Boundary Law: The Effect of Natural and Artificial Modifications, W73-04460	6E
Frio River, Three Rivers, Texas; Mississippi River at Winona, Minnesota; Survey Results. W73-04463	6G
Construction of Wastewater Facilities, Red Oak, Texas (Final Environmental Impact Statement). W73-04468	5G
Nitrogen and Phosphorus Dynamics in Three Central Texas Impoundments, W73-04484	5C
THAMES ESTUARY	
Lampreys and Teleost Fish, Other than Whitebait, in the Polluted Thames Estuary, W73-04262	5C
THEORETICAL ANALYSIS	
Behavior of Koyna Dam--Dec. 11, 1967 Earthquake, W73-04076	8E
 THERMAL ASSIMILATIVE CAPACITY	
Potential Thermal Effects of an Expanding Power Industry: Columbia River Basin, W73-04024	5C
 THERMAL DISCHARGES	
Conference on Beneficial Uses of Thermal Discharges. W73-04337	5G
Trends of Power Generation and Thermal Discharges in New York State, W73-04338	5G
An Independent View of the Use of Thermal Power Station Cooling Water to Supplement Inter-Regional Water Supply, W73-04346	5G

Problems and Opportunities in Waste Heat Disposal, W73-04347	SG
Agricultural and Urban Uses of Low-Temperature Heat, W73-04349	5G
Combination Urban-Power Systems Utilizing Waste Heat, W73-04350	5G
THERMAL POLLUTION	
Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	5D
Indexed Bibliography of Thermal Effects Literature - 1, W73-04020	5C
Siting A Thermal Multi-Purpose Energy Center, W73-04021	5C
The Four Big Fears About Nuclear Power, W73-04022	5C
Potential Thermal Effects of an Expanding Power Industry: Columbia River Basin, W73-04024	5C
Cooling Tower Plume Rise and Condensation, W73-04025	5D
Coping with Heated Waste Water Discharges from Steam-Electric Power Plants, W73-04026	5C
Power Plant Cooling Systems, W73-04029	5D
Marine Life in the Morro Bay Power Plant Discharge Canal, W73-04031	5C
Impact of Cooling Water on Lake Temperatures, W73-04037	5B
Logical Approaches to Power Supply and Environment, W73-04036	5G
Impact of Cooling Water on Lake Temperatures, W73-04037	5B
Thermal Pollution of Ground Water by Artificial Recharge, W73-04038	5B
Reclaiming Cooling Tower Blowdown, W73-04040	5D
A Procedure and Case Study Demonstrations for Evaluating the Cost of Thermal Effluent Control for Proposed Steam-Electric Generating Units, W73-04070	5G
A Procedure for Estimating Costs of Thermal Effluent Modifications for Existing Steam-Electric Generating Stations, W73-04071	5G
Large Power Plant Effluent Study (Lappes) Volume 3 - Instrumentation, Procedures, and Data Tabulations (1970), W73-04121	5A
Conference on Beneficial Uses of Thermal Discharges. W73-04337	5G
Trends of Power Generation and Thermal Discharges in New York State, W73-04338	5G
Development of Systems in Marine Fish Culture in the United Kingdom, W73-04339	5G
Problems and Opportunities in Waste Heat Disposal, W73-04347	5G
Agricultural and Urban Uses of Low-Temperature Heat, W73-04349	5G
THERMAL SPRINGS	
Thermal and Mineral Springs in the Southern Rocky Mountains of Canada, W73-04363	4B

SUBJECT INDEX

TRACKING TECHNIQUES

HERMAL STRATIFICATION																																																																																																																																																																						
Wind-Induced and Thermally Induced Currents in the Great Lakes, W73-04208	2H	Hydrobionts' Adaptation to a Toxic Factor, (In Russian), W73-04500																																																																																																																																																																				
THERMOCHEMICAL ANALYSIS		5C																																																																																																																																																																				
High Sensitivity Thermochemical Analysis, W73-0420	7B	Stream Faunal Recovery After Manganese Strip Mine Reclamation, W73-04546																																																																																																																																																																				
THERMOCOUPLE PSYCHROMETERS		5C																																																																																																																																																																				
Field Measurement of Soil Water Potential With Thermocouple Psychrometers, W73-04105	2G																																																																																																																																																																					
THERMODYNAMICS																																																																																																																																																																						
Non-Linear Thermodynamics of Soil-Water-Heat Systems, W73-03960	2G	TRACE ELEMENTS																																																																																																																																																																				
Thermodynamics of Soil-Water System, W73-03961	2G	THERMOELECTRIC POWER GENERATION		Trace-Metal Analysis Using Atomic Absorption Spectrophotometry, W73-04043	Circulating Water Systems Without Valves, W73-04035	5D	5A	THERMOMETRIC ENTHALPY TITRATION		Study of Rainout of Radioactivity in Illinois. W73-04052	Perchlorate Determination by Thermometric Enthalpy Titration, W73-04230	5A	5B	THERMOPHILIC BACTERIA		Determination of Selected Trace Elements in Natural Water Samples Using Spark Source Mass Spectroscopy, W73-04304	Studies on Variants of Bacillus Stearothermophilus Strain NCA 1518, W73-04246	5A	5A	THICKENERS		Environmental Chemistry: Grand River Studies, W73-04305	Studies on the Design Data of Gravity Thickening, W73-04433	5D	5B	THIEMS EQUATION		Characterization of the Sediments from the Tuira and Sabana River Estuaries, W73-04308	An Attempt at Estimating the Transmissibilities of Trappean Aquifers from Specific Capacity Values, W73-04527	2F	5C	THIN GOLD FILM TECHNIQUE		Activation Analysis Trace-Element Studies for Marine Biological Samples, W73-04327	Mercury Detection by Means of Thin Gold Films, W73-04123	5A	5A	THIN LAYER CHROMATOGRAPHY		Depositional Patterns, Facies, and Trace Element Accumulation in the Waukegan Member of the Late Pleistocene Lake Michigan Formation in Southern Lake Michigan, W73-04361	Thin Layer Chromatographic Detection of Chlorinated Hydrocarbons as Cross-Contaminants in Pesticide Formulations, W73-04396	5A	2J	TIDAL EFFECTS			A Reconnaissance of the Winyah Bay Estuarine Zone, South Carolina, W73-04095	7C		Elevation Changes Due to Tides, Long Beach, Calif., W73-04369	4B		TIDAL ENERGY			Tidal Energy From the Bay of Fundy, W73-04041	8A		TIDAL POWERPLANTS			Pumped Storage and Tidal Power in Energy Systems, W73-04033	5G		TIDAL WATERS			The Sediments and Sedimentary Processes of the Holocene Tidal Flat Complex, Delmarva Peninsula, Virginia, W73-04360	2L		TIDES			Tidal Energy From the Bay of Fundy, W73-04041	8A		TILE DRAINAGE			The Lateral Inflow into Submerged Drains, W73-04384	8B		TIME SERIES ANALYSIS			Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries, W73-04063	4A		Stochastic Structure of Water Use Time Series, W73-04098	4A		TISZA RIVER			Historic Flood on the Tisza River, May 12-18, 1970 (Vydushchiysya dozhdevoi pavodok na r. Tise 12-18 maya 1970 g.), W73-04112	2E		TOILETS			The Clivus Toilet - Sanitation Without Pollution, W73-04482	5G		TOLUENE DIISOCYANATE			Reduction of Atmospheric Toluene Diisocyanate by Water Vapor, W73-04184	5B		TOMATO INDUSTRY			Pollution Control Briefs. W73-03998	5D		TONTO CREEK BASIN (ARIZ)			Hydrologic Regimen of Lower Tonto Creek Basin, Gila County, Arizona-A Reconnaissance Study, W73-04059	3B		TOP SOIL			Topsoil Reaction to Mechanical Pressure, W73-04057	2G		TOPAZ LAKE (NEV AND CALIF)			Bathymetric Reconnaissance of Topaz Lake, Nevada and California, W73-04192	7C		TOPOGRAPHY			A New Topological Relationship as an Indicator of Drainage Network Evolution, W73-04203	4A		Quantitative Characterization of Channel Network Structure, W73-04204	8B		Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava), W73-04512	2J		TOXICITY			Legacy of the Mad Hatter, W73-04048	5C		Nuclear Activation Analysis of Se, As, Zn, Cd, and Hg in Environmental Matrices, W73-04328	5A		Toxic Effects of the Mycotoxins Aflatoxin B1, Rubratoxin B, Patulin, and Diacetoxyscirpenol on the Crustacean Cyclops fuscus, W73-04395	5C		Effect of Petroleum and Petroleum Products on Sturgeon and Other Fish, (In Russian), W73-04495	5C		TRACKING TECHNIQUES			Electrical Earth Resistivity Surveying in Landfill Investigations, W73-03918	5B	
THERMOELECTRIC POWER GENERATION		Trace-Metal Analysis Using Atomic Absorption Spectrophotometry, W73-04043																																																																																																																																																																				
Circulating Water Systems Without Valves, W73-04035	5D	5A																																																																																																																																																																				
THERMOMETRIC ENTHALPY TITRATION		Study of Rainout of Radioactivity in Illinois. W73-04052																																																																																																																																																																				
Perchlorate Determination by Thermometric Enthalpy Titration, W73-04230	5A	5B																																																																																																																																																																				
THERMOPHILIC BACTERIA		Determination of Selected Trace Elements in Natural Water Samples Using Spark Source Mass Spectroscopy, W73-04304																																																																																																																																																																				
Studies on Variants of Bacillus Stearothermophilus Strain NCA 1518, W73-04246	5A	5A																																																																																																																																																																				
THICKENERS		Environmental Chemistry: Grand River Studies, W73-04305																																																																																																																																																																				
Studies on the Design Data of Gravity Thickening, W73-04433	5D	5B																																																																																																																																																																				
THIEMS EQUATION		Characterization of the Sediments from the Tuira and Sabana River Estuaries, W73-04308																																																																																																																																																																				
An Attempt at Estimating the Transmissibilities of Trappean Aquifers from Specific Capacity Values, W73-04527	2F	5C																																																																																																																																																																				
THIN GOLD FILM TECHNIQUE		Activation Analysis Trace-Element Studies for Marine Biological Samples, W73-04327																																																																																																																																																																				
Mercury Detection by Means of Thin Gold Films, W73-04123	5A	5A																																																																																																																																																																				
THIN LAYER CHROMATOGRAPHY		Depositional Patterns, Facies, and Trace Element Accumulation in the Waukegan Member of the Late Pleistocene Lake Michigan Formation in Southern Lake Michigan, W73-04361																																																																																																																																																																				
Thin Layer Chromatographic Detection of Chlorinated Hydrocarbons as Cross-Contaminants in Pesticide Formulations, W73-04396	5A	2J																																																																																																																																																																				
TIDAL EFFECTS																																																																																																																																																																						
A Reconnaissance of the Winyah Bay Estuarine Zone, South Carolina, W73-04095	7C																																																																																																																																																																					
Elevation Changes Due to Tides, Long Beach, Calif., W73-04369	4B																																																																																																																																																																					
TIDAL ENERGY																																																																																																																																																																						
Tidal Energy From the Bay of Fundy, W73-04041	8A																																																																																																																																																																					
TIDAL POWERPLANTS																																																																																																																																																																						
Pumped Storage and Tidal Power in Energy Systems, W73-04033	5G																																																																																																																																																																					
TIDAL WATERS																																																																																																																																																																						
The Sediments and Sedimentary Processes of the Holocene Tidal Flat Complex, Delmarva Peninsula, Virginia, W73-04360	2L																																																																																																																																																																					
TIDES																																																																																																																																																																						
Tidal Energy From the Bay of Fundy, W73-04041	8A																																																																																																																																																																					
TILE DRAINAGE																																																																																																																																																																						
The Lateral Inflow into Submerged Drains, W73-04384	8B																																																																																																																																																																					
TIME SERIES ANALYSIS																																																																																																																																																																						
Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries, W73-04063	4A																																																																																																																																																																					
Stochastic Structure of Water Use Time Series, W73-04098	4A																																																																																																																																																																					
TISZA RIVER																																																																																																																																																																						
Historic Flood on the Tisza River, May 12-18, 1970 (Vydushchiysya dozhdevoi pavodok na r. Tise 12-18 maya 1970 g.), W73-04112	2E																																																																																																																																																																					
TOILETS																																																																																																																																																																						
The Clivus Toilet - Sanitation Without Pollution, W73-04482	5G																																																																																																																																																																					
TOLUENE DIISOCYANATE																																																																																																																																																																						
Reduction of Atmospheric Toluene Diisocyanate by Water Vapor, W73-04184	5B																																																																																																																																																																					
TOMATO INDUSTRY																																																																																																																																																																						
Pollution Control Briefs. W73-03998	5D																																																																																																																																																																					
TONTO CREEK BASIN (ARIZ)																																																																																																																																																																						
Hydrologic Regimen of Lower Tonto Creek Basin, Gila County, Arizona-A Reconnaissance Study, W73-04059	3B																																																																																																																																																																					
TOP SOIL																																																																																																																																																																						
Topsoil Reaction to Mechanical Pressure, W73-04057	2G																																																																																																																																																																					
TOPAZ LAKE (NEV AND CALIF)																																																																																																																																																																						
Bathymetric Reconnaissance of Topaz Lake, Nevada and California, W73-04192	7C																																																																																																																																																																					
TOPOGRAPHY																																																																																																																																																																						
A New Topological Relationship as an Indicator of Drainage Network Evolution, W73-04203	4A																																																																																																																																																																					
Quantitative Characterization of Channel Network Structure, W73-04204	8B																																																																																																																																																																					
Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava), W73-04512	2J																																																																																																																																																																					
TOXICITY																																																																																																																																																																						
Legacy of the Mad Hatter, W73-04048	5C																																																																																																																																																																					
Nuclear Activation Analysis of Se, As, Zn, Cd, and Hg in Environmental Matrices, W73-04328	5A																																																																																																																																																																					
Toxic Effects of the Mycotoxins Aflatoxin B1, Rubratoxin B, Patulin, and Diacetoxyscirpenol on the Crustacean Cyclops fuscus, W73-04395	5C																																																																																																																																																																					
Effect of Petroleum and Petroleum Products on Sturgeon and Other Fish, (In Russian), W73-04495	5C																																																																																																																																																																					
TRACKING TECHNIQUES																																																																																																																																																																						
Electrical Earth Resistivity Surveying in Landfill Investigations, W73-03918	5B																																																																																																																																																																					

SUBJECT INDEX

TRACKING TECHNIQUES

Sources of Water Pollution Established by Using a Neutron Activatable Tracer,
W73-04326 5B

Microbes as Tracers of Water Movement,
W73-04392 5B

TRANSBASIN WATER DIVERSION
Opportunity Costs of a Transbasin Diversion of Water 1. Methodology,
W73-04276 4A

TRANSLATIONS

Russian Radioecology. A Bibliography of Soviet Publications with Citations of English Translations and Abstracts,
W73-04298 5B

TRANSLOCATION

Absorption of Water by a Soil from a Circular Cylindrical Source,
W73-04200 5B

TRANSMISSION LINES

An Analysis of Transmission Line Audible Noise Levels Based Upon Field and Three-Phase Test Line Measurements,
W73-04085 8C

TRANSMISSION TOWERS

New Structural Designs for H. V. Transmission Towers,
W73-04078 8C

TRANSMISSIVITY

An Attempt at Estimating the Transmissibilities of Trappean Aquifers from Specific Capacity Values,
W73-04527 2F

TRANSPIRATION

Soil Moisture Pressure and Relative Transpiration of Plants in the Case of Soil Drought (In Russian),
W73-04524 2D

TREATMENT FACILITIES

GKN's New Water and Waste Treatment Division.
W73-04155 5D

Preventive Maintenance and Operational Know-How Improve Waste Treatment Systems,
W73-04278 5D

New Sensors for the Automatic Sorting of Municipal Solid Waste,
W73-04279 5D

Elements of Selection for Secondary Waste Treatment Systems,
W73-04287 5D

Optimizing an Activated Carbon Wastewater Treatment Plant,
W73-04421 5D

Water Treatment Plant for Today and Tomorrow,
W73-04435 5D

Clean Water and Power,
W73-04436 5G

Dry Graphite Film Protects Treatment Plant Units.
W73-04444 8G

Direct Filtration an Economic Answer to Water Treatment Needs,
W73-04446 5D

Award Winning Water Treatment Plant Features Automation,
W73-04447 5D

Construction of Wastewater Facilities, Red Oak, Texas (Final Environmental Impact Statement),
W73-04468 5G

TREES

Characteristics of the Seasonal Growth of Trees in the Light of Dendrochronological and Dendroclimatological Studies (In Russian),
W73-04344 2I

TRIBUTARIES

Environmental Chemistry: Grand River Studies,
W73-04305 5B

TRICKLE IRRIGATION

Trickle Irrigation....A More Efficient Means of Water Management,
W73-03953 3C

TRICKLING FILTERS

Sewage Treatment Plant and Method of Treating Sewage,
W73-04130 5D

Elements of Selection for Secondary Waste Treatment Systems,
W73-04287 5D

Performance of Deep Trickling Filters by Five Methods,
W73-04486 5D

TRITIUM

Radiological Physics Division Annual Report. Environmental Research, Jan.-Dec. 1971,
W73-04303 5A

The 1971 Tritium Symposium at Las Vegas,
W73-04318 5A

TROPOSPHERE

Concentration of C-14 in the Troposphere During 1953 to 1971, (In Russian),
W73-04323 5A

TURBIDITE LAYERS

Analysis of Turbidite Correlation in Cascadia Basin, Northeast Pacific Ocean,
W73-04249 5B

TURBIDITY

Effect of Powdered Activated Carbon on Coagulation with Alum,
W73-04165 5D

Separation of Activated Sludge from Mixed Liquor Using a Continuous Centrifuge,
W73-04431 5D

The Optimum Flocculant Concentration for Effective Flocculation of China Clay in Aqueous Suspension,
W73-04477 5D

TURBULENCE

Hurst Phenomenon in Turbulence,
W73-04206 2E

Wave Effect and Eddy Diffusivity in the Air near a Water Surface,
W73-04209 2E

Effect of Turbulence on BOD Testing,
W73-04443 5D

TURBULENT FLOW

Hurst Phenomenon in Turbulence,
W73-04206 2E

Relative Diffusion in Nonisotropic Turbulence,
W73-04212 5B

TURKMENIA

Phosphorescent Vibrios in Reservoirs of Turkmenia, (In Russian),
W73-04489 5C

TURNKEY CONTRACTS

The Role of the Specialist Water Treatment Company,
W73-04002 5F

UKRAINE

Investigation and Calculation of Components in the Hydrologic Regime of Rivers (Issledovaniya i raschety elementov hidrologicheskogo rezhima rek),
W73-04111 2E

Historic Flood on the Tisza River, May 12-18, 1970 (Vydayushchiya dozhddevoy pavodok na r. Tise 12-18 maya 1970 g.),
W73-04112 2E

Investigation of Storm Runoff on Small Watersheds in Lowlands of the Ukraine (Issledovaniya poter' dozhddevogo stoka na malykh vodosobrazhavshchikh ravninnoy territorii Ukrayiny),
W73-04113 2E

Effect of Karst on Floods on Left-Bank Tributaries of the Dniester River (Vlyaniye karsta na formirovaniye livevnykh pavodkov na levoberezhnykh pritokakh Dnestr'a),
W73-04114 2E

Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschety maksimal'nykh raskhodov vody dozhddevykh pavodkov na gornykh rekakh Kryma),
W73-04115 2E

Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego polovod'ya malykh vodotokov Ukrayiny i Moldavii),
W73-04116 2E

Effect of Underlying Formations on Annual Runoff in Lowlands of the Dniester River Basin (Vlyaniye na godovoy stok osobennostey podstilayushchey poverkhnostiv ravninnoy chasti basseyna Dnistra),
W73-04117 2E

Minimum Streamflow in Northwest Ukraine (Osobennosti formirovaniya minimal'nogo stoka rek Severo-Zapada Ukrayiny),
W73-04118 2E

Particle Size of Mudflows on Carpathian Rivers in the Ukraine (Granulometricheskiy sostav selevnykh otlozhenii na rekakh Ukrainskikh Karpat),
W73-04119 2E

ULTRAFILTRATION

Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters,
W73-04478 5D

ULTRAVIOLET VAPOR SPECTROMETRY

Species Identification in Visible-Ultraviolet Vapor,
W73-04418 5A

SUBJECT INDEX

			VARIABILITY
UNDERGROUND			
Observations of Radioruthenium and Radiocerium Isotopic Activity Ratios in Rain Water,			
W73-04313	5A		
Bioenvironmental Safety Studies, Amchitka Island, Alaska. Cannikin D + 2 Months Report,			
W73-04317	5C		
UNGULATES			
Notes on River Habitat Use by the Larger Ungulates in the Kalahari Gemsbok National Park,			
W73-04273	21		
UNION PARISH (LA)			
Water Resources of Union Parish, Louisiana,			
W73-04503	4B		
UNITED KINGDOM			
Leading Question,			
W73-04017	5D		
UNITED NATIONS			
Law of the Sea.			
W73-04465	6E		
UNITED STATES			
Irrigation Survey.			
W73-03980	3F		
Environmental Defense Fund, Inc. V. Corps of Engineers of the United States Army (ADEQUACY of Environmental Impact Statement).			
W73-04471	6E		
Fluvial-Sediment Discharge to the Oceans from the Conterminous United States,			
W73-04526	2J		
UNSATURATED FLOW			
Measurement of Unsaturated Conductivity and Diffusivity by Infiltration Through an Impeding Layer.			
W73-03971	2G		
UNSTEADY FLOW			
Streamflow Routing (With Applications to North Carolina Rivers),			
W73-03908	4A		
Computer Model of Vortex Shedding from a Cylinder,			
W73-04216	8B		
UPLIFT PRESSURE			
Uplift Computations for Hollow Gravity Dams,			
W73-04083	8A		
URBAN CLIMATOLOGY			
The Urban Climate,			
W73-04355	4C		
URBAN EROSION			
Urban Erosion—Practical Alternatives,			
W73-04359	4D		
URBAN HYDROLOGY			
The Urban Climate,			
W73-04355	4C		
Rainfall and Runoff in Urban Areas—A Case Study of Flooding in the Piedmont of North Carolina,			
W73-04356	4C		
Rainfall and Runoff in Urban Areas: Theory and Prediction,			
W73-04357	4C		
Erosion Sediment Production,			
W73-04358	2J		
URBANIZATION			
The Urban Climate,			
W73-04355	4C		
Urban Erosion—Practical Alternatives,			
W73-04359	4D		
URINE			
Fluoride Ion Activity Electrode as a Suitable Means for Exact Direct Determination of Urinary Fluoride,			
W73-04415	5A		
USSR			
Investigation and Calculation of Components in the Hydrologic Regime of Rivers (Issledovaniye i raschety elementov gidrologicheskogo rezhima rek).			
W73-04111	2E		
Historic Flood on the Tisza River, May 12-18, 1970 (Vydayushchiya dozhdovoy pavodok na r. Tise 12-18 maya 1970 g.),			
W73-04112	2E		
Investigation of Storm Runoff on Small Watersheds in Lowlands of the Ukraine (Issledovaniye poter' dozhddevogo stoka na malykh vodosoborakh ravinnnoy territorii Ukrayny),			
W73-04113	2E		
Effect of Karst on Floods on Left-Bank Tributaries of the Dniester River (Vliyanie karsta na formirovaniye livneykh pavodkov na levoberezhnykh pritokakh Dnestra),			
W73-04114	2E		
Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschet maksimal'nykh raskhodov vody dozhddevykh pavodkov na gornykh rekakh Kryma),			
W73-04115	2E		
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego polovod'ya malykh vodotokov Ukrayny i Moldavii),			
W73-04116	2E		
Effect of Underlying Formations on Annual Runoff in Lowlands of the Dniester River Basin (Vliyanie na godovy stok osobennostey podstilayushchey poverkhnosti ravinninoy chasti basseyna Dnestra),			
W73-04117	2E		
Minimum Streamflow in Northwest Ukraine (Osobennosti formirovaniya minimal'nogo stoka rek Severo-Zapada Ukrayny),			
W73-04118	2E		
Particle Size of Mudflows on Carpathian Rivers in the Ukraine (Granulometricheskiy sostav selevky otlozheniy na rekakh Ukrainskikh Karpat),			
W73-04119	2E		
Hydrologic Studies in Northern Algeria (O hidrologicheskoy i zuchenosti territorii Severnogo Alzhira),			
W73-04120	2E		
Russian Radioecology. A Bibliography of Soviet Publications with Citations of English Translations and Abstracts,			
W73-04298	5B		
Chemical Composition of Atmospheric Precipitation in the Deputatskiy Region (K-			
himicheskiy sostav atmosfernykh osadkov, vypadayushchikh na territorii Deputatskogo rayona),			
W73-04511	2B		
Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava),			
W73-04512	2J		
Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii),			
W73-04513	2C		
Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniyu moreiskikh beregov. 13-21 sentyabrya 1971 g. Palanga-Nida. Tez iss doklazov),			
W73-04514	2J		
Relationship Between Circulation and Structure of Waters of the Indian Ocean (O vzaimosvazi tsirkulyatsii i struktury vod Indiyskogo okeana),			
W73-04515	2E		
Paleomagnetic Studies of Bottom Sediments from the Indian Ocean Area of the Antarctic (Paleomagnitnye issledovaniya donnykh otlozheniy Indiyskogo sektora Antarktiki),			
W73-04516	2J		
New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin (Novyye dannyye o diatomovykh vodoroslyakh otlozhenii boreal'noy transgressii v basseyne r. Vagi),			
W73-04517	2J		
UTAH			
Processes Wastes for Profit.			
W73-04289	5D		
VAGA RIVER			
New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin (Novyye dannyye o diatomovykh vodoroslyakh otlozhenii boreal'noy transgressii v basseyne r. Vagi),			
W73-04517	2J		
VALLEY DEVELOPMENT			
Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava),			
W73-04512	2J		
VALLEYS			
Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava),			
W73-04512	2J		
VANADIUM			
Vanadium Determination in Biological Materials at Nanogram Levels by a Catalytic Method,			
W73-04409	5A		
VAPOR PRESSURE			
Relation Between Retention Indices and Boiling Points of Hydrocarbons Differing Slightly in Their Vapor Pressures,			
W73-04417	5A		
VARIABILITY			
Using Canonical Correlation for Hydrological Predictions,			
W73-04381	2E		

SUBJECT INDEX

VARIABILITY

A Sampling Scheme for Shallow Snowpacks, W73-04386	7B
VASCULAR PLANTS	
Changes of Vascular Aquatic Flowering Plants During 70 Years in Put-in-Bay Harbor, Lake Erie, Ohio, W73-04258	5C
VAUGHAN LEWIS ICEFALL (ALA)	
Electronic Detection of Serac Avalanches and Glacier Noise at Vaughan Lewis Icefall, Alaska, W73-03929	2C
VEGETABLE CROPS	
Water Use Efficiency of Vegetable Crops Grown over Asphalt Moisture Barriers, W73-03902	3F
VEGETATION TYPES	
Vegetation of the Mesters Vig District, Northeast Greenland: General Summary and Discussion, W73-04264	2I
VELOCITY	
A Report on the Prototype Data Collected in the Potomac River for the Chesapeake Bay Model Study, W73-04101	2L
Effects of Acclimation and Acute Temperature Experience on the Swimming Speed of Juvenile Coho Salmon, W73-04243	5C
VIBRIOS	
Phosphorescent Vibrios in Reservoirs of Turk- menia, (In Russian), W73-04489	5C
VIRGINIA	
The Sediments and Sedimentary Processes of the Holocene Tidal Flat Complex, Delmarva Peninsula, Virginia, W73-04360	2L
VIRICIDES	
A Comparative Study of the Inactivation of Viruses in Water by Chlorine, W73-03991	5F
VIRUSES	
A Comparative Study of the Inactivation of Viruses in Water by Chlorine, W73-03991	5F
Concentration of Reovirus and Adenovirus From Sewage and Effluents by Protamine Sulfate (Salmine) Treatment, W73-03995	5D
Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pol- lution of Waters, W73-04390	5F
Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pol- lution of Waters, W73-04478	5D
VOLCANIC SOILS	
Forms of Nitrogen in the Volcanic Soils of Sibundoy (In Spanish), W73-04032	5B
VOLGA DELTA	
The Significance of the Rivers of the Volga Delta in the Spawning of Fish (In Russian), W73-04522	2I

VOLGA RIVER	
Contribution to Methods of Applied Investiga- tions of Soil Erosion on the Right Bank of the Volga in the Gorki Region, (In Russian), W73-04053	2J
VOLUMETRIC ANALYSIS	
Perchlorate Determination by Thermometric Enthalpy Titration, W73-04230	5A
Titrimetric Microdetermination of Zinc With EDTA Using 1,5-Di-Beta-Naphthylthiocar- bazone (HNDZ) as an Extractive Indicator, W73-04231	5A
A High-Selective Titration Method for Deter- mining Copper with 2,2-Bicinchoninic Acid (In Russian), W73-04248	5A
New, Directly Digital Automatic Titration Ap- paratus, W73-04252	7B
VORTEX SHEDDING	
Computer Model of Vortex Shedding from a Cylinder, W73-04216	8B
VORTICES	
Computer Model of Vortex Shedding from a Cylinder, W73-04216	8B
WASTE DISPOSAL	
Dehydrated Poultry Waste in Poultry Rations, W73-03992	5E
Doing Time Takes on a New Meaning for the Wastemakers, W73-04010	5G
Studies of the Influence of Lagoons and Land- fills on Groundwater Quality, W73-04066	5B
Processes Wastes for Profit. W73-04289	5D
Radioactive Waste Repository Project; Annual Progress Report for Period Ending September 30, 1972, W73-04294	3B
The Clivus Toilet - Sanitation Without Pollu- tion, W73-04482	5G
Reverse Osmosis for Wastewater Treatment, W73-04487	5D
WASTE DISPOSAL WELLS	
Construction of Waste-Injection Monitor Wells Near Pensacola, Florida, W73-04536	5E
WASTE HEAT	
Siting A Thermal Multi-Purpose Energy Center, W73-04021	5C
Power Plant Cooling Systems, W73-04029	5D
Logical Approaches to Power Supply and En- vironment, W73-04036	5G
Impact of Cooling Water on Lake Tempera- tures, W73-04037	5B
A Procedure and Case Study Demonstrations for Evaluating the Cost of Thermal Effluent Control for Proposed Steam-Electric Generat- ing Units,	
W73-04070	5G
A Procedure for Estimating Costs of Thermal Effluent Modifications for Existing Steam- Electric Generating Stations,	
W73-04071	5G
Conference on Beneficial Uses of Thermal Discharges.	
W73-04337	5G
Development of Systems in Marine Fish Cul- tivation in the United Kingdom,	
W73-04339	5G
Mariculture in Japan Using Heated Effluent Water,	
W73-04340	5G
Catfish Farming - Beneficial Use of Waste Heat,	
W73-04341	5G
The Thermal-Water Horticultural Demonstra- tion Project at Springfield, Oregon,	
W73-04343	5G
Waste Heat Use in Controlled-Environment Greenhouses,	
W73-04345	5G
An Independent View of the Use of Thermal Power Station Cooling Water to Supplement Inter-Regional Water Supply,	
W73-04346	5G
Problems and Opportunities in Waste Heat Disposal,	
W73-04347	5G
Agricultural and Urban Uses of Low-Tempera- ture Heat,	
W73-04349	5G
Combination Urban-Power Systems Utilizing Waste Heat,	
W73-04350	5G
Beneficial Uses of Waste Heat - An Evalua- tion,	
W73-04351	5G
WASTE HEAT UTILIZATION	
A Procedure and Case Study Demonstrations for Evaluating the Cost of Thermal Effluent Control for Proposed Steam-Electric Generat- ing Units,	
W73-04070	5G
WASTE PICKLE DISPOSAL PROCESS	
Industrial Waste Can Be An Asset. W73-04280	5D
WASTE STORAGE	
Reduces BOD 99%...At Low Cost, W73-04001	5D
WASTE TREATMENT	
Aes New England Council Sponsors First Waste Treatment Conference. W73-04154	5G
Preventive Maintenance and Operational Know-How Improve Waste Treatment Systems, W73-04278	5D

SUBJECT INDEX

WASTE WATER TREATMENT

New Process May Solve Utility Waste Problem. W73-04283	SD	Adsorption Process Eases Acid Recovery. W73-04005	SD	GKN'S New Water and Waste Treatment Division. W73-04155	SD
Radioactive Wastes, W73-04312	SD	Adjustable Drive Units Solve Seasonal Waste Water Treatment Problems. W73-04009	SD	Bulletin on Waste Water Clean-Up Process. W73-04156	SD
Sludge Disposal-My Problem and Its Solution: A Symposium. W73-04451	SD	Recovers Salable Products from Waste Yeast, W73-04014	SD	Simon-Hartley-Carousel Sewage and Effluent Treatment. W73-04158	SD
The Clivus Toilet - Sanitation Without Pollution, W73-04482	SG	Waste Acid to be Recovered and Refused. W73-04015	SD	Reconditions Brine to Cut Pollution, W73-04160	SD
Corporate Checkpoints to Pollution Control, W73-04483	SG	Protective Measures for Cooling Systems in Keeping with Water Quality Standards, W73-04018	SD	Inline Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment, W73-04161	SD
Tannery Effluents and Their Treatment - Part I, W73-04550	SD	Ion Exchange Resin for Removal of Heavy Metal Ions in Waste Water, W73-04047	SD	Reduces Effluent from Blanching, W73-04163	SD
WASTE WATER DISPOSAL		Bioconcentration of Arsenic by Activated Sludge Biomass, W73-04124	SD	Effect of Powdered Activated Carbon on Coagulation with Alum, W73-04165	SD
Reduces Effluent from Blanching, W73-04163	SD	Sewage Treatment Plant and Method of Treating Sewage, W73-04130	SD	Inhibiting Water Formed Deposits with Threshold Compositions, W73-04166	SD
Construction of Wastewater Facilities, Red Oak, Texas (Final Environmental Impact Statement). W73-04468	SG	Internal Precipitation of Phosphate from Activated Sludge, W73-04131	SD	Reverse Osmosis for Waste Water Treatment: What, When., W73-04187	SD
WASTE WATER EFFLUENTS		Method of Water Filtration, W73-04132	SD	Studies of Nitrogen Compounds in Waters: I. Separate of Nitrate and Nitrite Nitrogen in Waste Waters (In Japanese), W73-04188	SD
Wastewater Reclamation by Irrigation, W73-04480	SD	Batch Sewage Treatment System, W73-04136	SD	Preventive Maintenance and Operational Know-How Improve Waste Treatment Systems, W73-04278	SD
WASTE WATER (POLLUTION)		Fluid Pollution Eradicator System Including an Air Bubble Scrubbing Unit, W73-04137	SD	Industrial Waste Can Be An Asset. W73-04280	SD
Algal Assay Procedure, W73-04404	SA	Liquid Treatment Method, W73-04138	SD	Reduction of Chromate by Zinc at Constant pH's. Chemistry of Chromate Treatment (Part 2) (In Japanese), W73-04282	SD
WASTE WATER TREATMENT		Treatment of Sewage, W73-04139	SD	New Process May Solve Utility Waste Problem. W73-04283	SD
Researches on Removal of Colloidal Matter From Waste Water Produced in Sanitary Porcelain Ware and Ceramic Industry, W73-03990	SD	Combined Steam Power Plant and Water Distillation System, W73-04140	3A	Experiences with the Sludge Program in the Denver Area, W73-04286	SD
A Comparative Study of the Inactivation of Viruses in Water by Chlorine, W73-03991	SF	Sewage Treatment System, W73-04141	SD	Elements of Selection for Secondary Waste Treatment Systems, W73-04287	SD
Studies on Purification Theories and Mechanism of Activated Sludge. (III) Similarity in Adsorption Mechanism of Activated Sludge and Charcoal, W73-03993	SD	Method and Apparatus for Removing Sludge from Liquid, W73-04142	SD	Processes Wastes for Profit. W73-04289	SD
Studies on Purification Theories and Mechanism of Activated Sludge. (IV) Application of Purification Theories to the Activated Sludge Process, W73-03994	SD	Liquid and Sludge Treatment, W73-04143	SD	Ozone Active Carbon Treatment of Sea Water for Swimming Pools, (In German), W73-04411	SD
Concentration of Reovirus and Adenovirus From Sewage and Effluents by Protamine Sulfate (Salmine) Treatment, W73-03995	SD	Tertiary Filtering Arrangement, W73-04144	SD	Optimizing an Activated Carbon Wastewater Treatment Plant, W73-04421	SD
Pollution Control Briefs. W73-03998	SD	Wastewater Treatment Sequence, W73-04146	SD	Automatic Treatment of Cooling Water, W73-04422	SD
Acid Mine Drainage Treatment Process Termed Successful. W73-03999	SD	Process and System for Control of Fluids in Water Disposal Surge Tanks, W73-04148	SD	Water Pollution Control in Pulp and Paper Industry, W73-04424	SD
Reduces BOD 99%...At Low Cost, W73-04001	SD	Treating Liquid Waste Effluent, W73-04150	SD	Sludge Dewatering Tests with a Belt Press, W73-04432	SD
The Role of the Specialist Water Treatment Company, W73-04002	SF	Backflushing Filter, W73-04151	SD		
Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	SD	Method and Apparatus for Clarifying Liquids, W73-04152	SD		
		As New England Council Sponsors First Waste Treatment Conference. W73-04154	SG		

SUBJECT INDEX

WASTE WATER TREATMENT

Studies on the Design Data of Gravity Thickening, W73-04433	SD	Pollution Control in Sulphur Mining, W73-04498	SD	A Review of the Arsenic Cycle in Natural Waters, W73-04541	5B
Water Treatment Plant for Today and Tomorrow, W73-04435	SD	Lake Michigan Clean-Up Laggings. W73-04547	SD	WATER CIRCULATION	
Clean Water and Power, W73-04436	SG	Tannery Effluents and Their Treatment - Part I, W73-04550	SD	Thermal Scanner Observations over Lake Ontario, W73-03949	7B
What is Expected in In-Plant Control and Waste Treatment in the Future, W73-04437	SD	WASTE YEAST RECOVERY		Wind-Induced and Thermally Induced Currents in the Great Lakes, W73-04208	2H
3-Stage Ponds Earn Plaudits, W73-04438	SD	Recovers Salable Products from Waste Yeast, W73-04014	SD	WATER CONSERVATION	
Andover Sewage-Treatment Works, W73-04439	SD	WATER ANALYSIS		Development of Economic Water Harvest Systems for Increasing Water Supply - Phase II, W73-03901	3B
Carbonate and Phosphate Detergent Builders: Their Impact on the Environment, W73-04440	SC	Activation Analysis of Mercury and Other En- vironmental Pollutants in Water and Aquatic Ecosystems, W73-04051	5A	Trickle Irrigation....A More Efficient Means of Water Management, W73-03953	3C
Kinetic Behavior of Mixed Populations of Ac- tivated Sludge, W73-04441	SD	3-Propyl-5-Hydroxy-5-D-Arabinotetrahydrox- ybutyl-3-Thiazolidine-2-Thione, A Specific Colorimetric Reagent for the Determination of Copper in Water, W73-04056	5A	Starting with Trickle Irrigation, W73-03958	3C
Effect of Turbulence on BOD Testing, W73-04443	SD	Marina Del Rey: A Study of Environmental Variables in a Semi-Enclosed Coastal Water, W73-04197	5B	WATER CONSUMPTION	
The Case for Higher Rate Waste Water Treat- ment, W73-04445	SD	Determination of Selected Trace Elements in Natural Water Samples Using Spark Source Mass Spectroscopy, W73-04304	5A	Method for the Direct Measurement of Ab- solute Water Consumption of Woody Plants (In German), W73-04177	2I
Direct Filtration an Economic Answer to Water Treatment Needs, W73-04446	SD	WATER BALANCE		Minimizes Fruit Peel Pollution, W73-04284	5D
Award Winning Water Treatment Plant Fea- tures Automation, W73-04447	SD	Comparison of Recharge to Groundwater Under Pasture and Forest Using Environmental Tritium, W73-04373	2F	WATER CONTENT (SOILS)	
Construction of Wastewater Facilities, Red Oak, Texas (Final Environmental Impact State- ment). W73-04468	SG	Water Table Fluctuations Under Forest and Pasture in a Karstic Region of Southern Aus- tralia, W73-04374	2F	Determination of the Moisture Density and the Water Content Variation of a Soil by Measur- ing the Absorption of Gamma Rays, (In Ger- man), W73-04072	2G
Thermal Conditioning Tests of Activated Sludge and Anaerobic Digestion Test of the Fil- trates, W73-04476	SD	Interception of Rain by Forest Vegetation-Esti- mation of Daily Interception Using a Mathe- matical Model (Interception de la pluie par la vegetation forestiere—estimation de l'intercep- tion journaliere a l'aide d'un modele mathe- matique), W73-04530	2A	WATER DELIVERIES	
The Optimum Flocculant Concentration for Ef- fective Flocculation of China Clay in Aqueous Suspension, W73-04477	SD	WATER CHEMISTRY		Waste Water Reuse-A Supplemental Supply, W73-03987	5D
Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pol- lution of Waters, W73-04478	SD	Control of Copper Electropolating Wastes: An Annotated Bibliography, W73-04467	5G	WATER DEMAND	
Performance of Deep Trickling Filters by Five Methods, W73-04486	SD	The Physicochemical Limnology of a Stretch of the Guadalupe River, Texas, With Five Main- Stream Impoundments, W73-04505	2H	Integration of the Agricultural Demand Func- tion for Water and the Hydrologic Model of the Pecos Basin, W73-04277	6D
Reverse Osmosis for Wastewater Treatment, W73-04487	SD	Ice Analyses. Data From Three Norwegian Lakes, W73-04506	2C	WATER DISTRIBUTION	
Tannery Effluents and Their Treatment-Con- clusion, W73-04488	SD	Chemical Composition of Atmospheric Precipitation in the Deputatskiy Region (K- himicheskiy sostav atmosfernykh osadkov, vypadayushchikh na territorii Deputatskogo rayona), W73-04511	2B	Regional Development of Public Water Supply Systems, W73-04064	3D
Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India, W73-04496	SD	Some Coordination Effects in Natural Waters of Ethiopia, W73-04529	2K	WATER EQUIVALENT	
Ion Exchange for the Metal Products Finisher- Part I, W73-04497	SD	The Output of a Lowland Catchment, W73-04533	3B	A Sampling Scheme for Shallow Snowpacks, W73-04386	7B
				WATER HAMMER	
				Circulating Water Systems Without Valves, W73-04035	5D
				WATER HARVESTING	
				Development of Economic Water Harvest Systems for Increasing Water Supply - Phase II, W73-03901	3B
				WATER LEVEL FLUCTUATIONS	
				Bathymetric Reconnaissance of Marlette and Spooner Lakes, Washoe County and Carson City, Nevada, W73-04100	7C
				Bathymetric Reconnaissance of Rye Patch Reservoir and the Pitt-Taylor Reservoirs, Pershing County, Nevada, W73-04227	7C

SUBJECT INDEX

WATER QUALITY

A Hydrologic Description of Lake Magdalene Near Tampa, Florida, W73-04537	7C	Factors of Ecologic Succession in Oligotrophic Fish Communities of the Laurentian Great Lakes, W73-04399	5C	Radioactive Waste Repository Project; Annual Progress Report for Period Ending September 30, 1972, W73-04294	5B
WATER LEVELS		The Eutrophication Problem, W73-04403	5C	Environmental Surveillance at Hanford for CY-1971, W73-04310	5A
Ground-Water Levels in the South Platte River Valley of Colorado, 1968-72, W73-04211	7C	Limnology and Fish Ecology of Sockeye Salmon Nursery Lakes of the World, W73-04405	5C	Sources of Water Pollution Established by Using a Neutron Activatable Tracer, W73-04326	5B
Photogrammetry and Hydraulic Surfaces, W73-04368	7B	Loch Lomond: Man's Effects on the Salmonid Community, W73-04407	5C	Nuclear Activation Analysis of Se, As, Zn, Cd, and Hg in Environmental Matrices, W73-04328	5A
WATER MEASUREMENT		Europe's Majestic Sewer, W73-04428	5G	Activation analysis of Heavy Metals in Surface Waters Using Ion Exchange Filter Paper and Cyanide Complexing, W73-04329	5A
A Comparison of Morphometric Measures of Bankfull, W73-04375	2E	Method and Apparatus for Controlling Substant Oil Seepage, W73-04128	5G	A Study of the Need for and Feasibility of a Program for the Removal and Disposal of Drift and Other Debris, Including Abandoned Vessels, from the Public Harbors and Associated Channels Under the Jurisdiction of the Department of the Army. W73-04455	8A
WATER POLICY		Oil Spillage Control Process, W73-04129	5G	Non-Point Source Pollution From Agricultural, Rural, and Developing Areas. W73-04462	5B
A Study of Water Institutions of Hawaii, W73-04062	6B	Internal Precipitation of Phosphate from Activated Sludge, W73-04131	5D	Eden Preserved, W73-04466	5G
WATER POLLUTION		Batch Sewage Treatment System, W73-04136	5D	Control of Copper Electroplating Wastes: An Annotated Bibliography, W73-04467	5G
Birds Give Warning, W73-04049	5C	Liquid Treatment Method, W73-04138	5D	WATER PURIFICATION	
Air and Water Pollution. W73-04178	5G	Treatment of Sewage, W73-04139	5D	Method of Water Filtration, W73-04132	5D
Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant, W73-04311	5A	Sewage Treatment System, W73-04141	5D	Reverse Osmosis Water Purifier, W73-04135	3A
Fallout Program Quarterly Summary Report June 1, 1972 - September 1, 1972 - An Appendix, W73-04316	5B	Method and Apparatus for Removing Sludge from Liquid, W73-04142	5D	WATER QUALITY	
Sources of Water Pollution Established by Using a Neutron Activatable Tracer, W73-04326	5B	Liquid and Sludge Treatment, W73-04143	5D	Salinity Problems in Arid Lands Irrigation: A Literature Review and Selected Bibliography, W73-03910	3C
Activation analysis of Heavy Metals in Surface Waters Using Ion Exchange Filter Paper and Cyanide Complexing, W73-04329	5A	Tertiary Filtering Arrangement, W73-04144	5D	Quality of Surface Waters of the United States, 1967: Parts 9-11. Colorado River Basin to Pacific Slope Basins in California. W73-03924	7C
Europe's Majestic Sewer, W73-04428	5G	Wastewater Treatment Sequence, W73-04146	5D	Hydrographic Observations in Tampa Bay, Florida-1969, W73-03926	5A
WATER POLLUTION CONTROL		Treating Liquid Waste Effluent, W73-04150	5D	Remote Sensing Considerations for Water Quality Monitoring, W73-03947	5B
The Expansion of Federal Common Law and Federal Question Jurisdiction to Interstate Pollution, W73-04461	5G	Backflushing Filter, W73-04151	5D	The Chemical History of Some Spring Waters in Carbonate Rocks, W73-03959	5B
Conference in the Matter of Pollution of the Interstate Waters of the Merrimack and Nashua Rivers and Their Tributaries, Massachusetts-New Hampshire and the Intrastate Portions of Those Waters Within the State of Massachusetts. W73-04469	5G	Method and Apparatus for Clarifying Liquids, W73-04152	5D	Finite-Difference Convection Errors, W73-03997	2E
Corporate Checkpoints to Pollution Control, W73-04483	5G	Electrical Earth Resistivity Surveying in Landfill Investigations, W73-03918	5B	Brucine Analysis for High Nitrate Concentrations, W73-04000	5A
WATER POLLUTION EFFECTS		Agriculturally-Polluted Irrigation Water as a Source of Plant-Parasitic Nematode Infestation, W73-03954	5B	Determination of Hydrocarbon Residues in Water, W73-04007	5A
Legacy of the Mad Hatter, W73-04048	5C	Mercury Pollution, W73-04055	5B	Studies of the Influence of Lagoons and Landfills on Groundwater Quality, W73-04066	5B
Effects on Freshwater Fish, W73-04236	5C	Microbiology of Water, W73-04235	5B		
Water Pollution. Freshwater Macroinvertebrates, W73-04238	5C				
The Instability of Ocean Populations, W73-04240	5C				

SUBJECT INDEX

WATER QUALITY

Buffalo Lake Recreational Water Quality: A Study in Bacteriological Data Interpretation, W73-04162 5B

Marina Del Rey: A Study of Environmental Variables in a Semi-Enclosed Coastal Water, W73-04197 5B

Before and After Studies of the Effects of a Power Plant Installation on Lake LBJ - Measurement and Prediction of Abnormal Reservoir Operations on Lake LBJ's Water Quality, W73-04336 5B

Ground Water Reconnaissance in the Arghandab River Basin Near Kandahar, Afghanistan, W73-04379 4B

Europe's Majestic Sewer, W73-04428 5G

The Case for Higher Rate Waste Water Treatment, W73-04445 5D

Construction of Waste-Injection Monitor Wells Near Pensacola, Florida, W73-04536 5E

WATER QUALITY CONTROL

Protective Measures for Cooling Systems in Keeping with Water Quality Standards, W73-04018 5D

Optimal Pricing Policies for Conjunctive Urban Water Supply and Waste Water Treatment Systems, W73-04060 5G

Former Camp Parks Sewage Disposal Plant, Parcel A-2 Pleasanton, California (Final Environmental Impact Statement), W73-04474 5G

WATER QUALITY STANDARDS
Effluent Standards and Water Reuse, W73-04425 5D

Corporate Checkpoints to Pollution Control, W73-04483 5G

Effluent Standards as Proposed by the Royal Commission on Sewage Disposal, W73-04491 5G

Higher Standards: The Local Authorities View, W73-04492 5F

Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India, W73-04496 5D

WATER RATES
Optimal Pricing Policies for Conjunctive Urban Water Supply and Waste Water Treatment Systems, W73-04060 5G

Flexible Pricing in Water Supply Planning--For Flexible Engineers, W73-04354 6A

WATER RECOVERY
GKN'S New Water and Waste Treatment Division, W73-04155 5D

WATER RENOVATION
Wastewater Reclamation by Irrigation, W73-04480 5D

WATER RENOVATIONS PLANTS
Waste Water Reuse-A Supplemental Supply, W73-03987 5D

WATER RESOURCES DEVELOPMENT
Savannah River Basin Inspection, W73-04472 6E

Ground Water in the Plaquemine-White Castle Area, Iberville Parish, Louisiana, W73-04502 4B

Water Resources of Union Parish, Louisiana, W73-04503 4B

Water Resources of Ouachita Parish, Louisiana, W73-04504 4B

WATER RESOURCES RESEARCH
National Water Research Opportunities, W73-03911 6B

WATER REUSE
Waste Water Reuse-A Supplemental Supply, W73-03987 5D

Reclamation and Industrial Reuse of Amarillo's Waste Water, W73-03988 5D

Reclaiming Cooling Tower Blowdown, W73-04040 5D

Data Record for Public Attitudes Toward Reuse of Reclaimed Water, W73-04059 6B

Experiences with the Sludge Program in the Denver Area, W73-04286 5D

Processes Wastes for Profit, W73-04289 5D

Effluent Standards and Water Reuse, W73-04425 5D

Lysimetric Method of Examining the Degree of Dehelminthization of Sewage (In Russian), W73-04448 5D

Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters, W73-04478 5D

Wastewater Reclamation by Irrigation, W73-04480 5D

Reverse Osmosis for Wastewater Treatment, W73-04487 5D

WATER SHORTAGE
Water Shortage in the Forest Floor of Subalpine Forests of Alberta, W73-04169 4A

WATER SOFTENING
Method and Apparatus for Softening or Desalting Water by Ion Exchange, W73-04133 3A

Method and Apparatus for Water Softening, W73-04145 3A

WATER SOURCES
Atmospheric Water Collector, W73-04149 3B

WATER SPREADING
The Numerical Analysis of Infiltration Into Heterogeneous Porous Media, W73-04091 2G

WATER STRESS
Determination of Water Stress of Eucalypts in the Field, W73-04485 2I

WATER STRUCTURE
The Structure of Liquid Water, W73-03903 2K

Relationship Between Circulation and Structure of Waters of the Indian Ocean (O vzaimosvazytsi tsirkulyatsii i struktury vod Indiyskogo okeana), W73-04515 2E

WATER SUPPLY
Regional Development of Public Water Supply Systems, W73-04064 3D

Atmospheric Water Collector, W73-04149 3B

Opportunity Costs of a Transbasin Diversion of Water 1. Methodology, W73-04276 4A

An Independent View of the Use of Thermal Power Station Cooling Water to Supplement Inter-Regional Water Supply, W73-04346 5G

Flexible Pricing in Water Supply Planning--For Flexible Engineers, W73-04354 6A

Water Supply for the Nuclear Rocket Development Station at the U.S. Atomic Energy Commission's Nevada Test Site, W73-04370 4B

Genesee River Basin, New York and Pennsylvania (Final Environmental Impact Statement), W73-04475 8A

WATER SURFACES
Photogrammetry and Hydraulic Surfaces, W73-04368 7B

WATER TABLE
Determination of a Water Table in a Soil Profile Using the Platinum Oxygen Cathode, W73-03985 2G

Steady-State Evaporation Through Non-Homogeneous Soils From a Shallow Water Table, W73-04110 2D

Calculation of Discharge from Partially Penetrating Wells in Water Table Aquifers in Isotropic and Anisotropic Soils (Determination du debit des puits incomplets de nappes libres foncees en terrain isotrope et anisotrope), W73-04382 4B

WATER TEMPERATURE
An Experimental Model for Automated Detection, Measurement and Quality Control of Sea-Surface Temperatures From ITOS-IR Data, W73-03940 7C

Sea Surface Temperature Mapping off the Eastern United States Using NASA's Itos Satellite, W73-03942 7B

A Technique for the Comparison of Contact and Non-Contact Measurements of Water Surface Temperature, W73-03948 7B

Thermal Scanner Observations over Lake Ontario, W73-03949 7B

Impact of Cooling Water on Lake Temperatures, W73-04037 5B

SUBJECT INDEX

X-RAY ANALYSIS

Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico, W73-04241	5C	WATER YIELD Comparison of Multiple Regression and Principal Component Regression for Predicting Water Yields in Kentucky, W73-04199	4A	WELL DATA Ground-Water Levels in the South Platte River Valley of Colorado, 1968-72, W73-04211	7C
Effects of Acclimation and Acute Temperature Experience on the Swimming Speed of Juvenile Coho Salmon, W73-04243	5C	Ground Water Reconnaissance in the Arghandab River Basin Near Kandahar, Afghanistan, W73-04379	4B	WEST VALLEY (NY) Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant, W73-04311	5A
WATER TREATMENT		Calculation of Discharge from Partially Penetrating Wells in Water Table Aquifers in Isotropic and Anisotropic Soils (Determination du debit des puits incomplets de nappes libres forces en terrain isotrope et anisotrope), W73-04382	4B	WETTING The Changeability of the Hydraulic Conductivity of Saturated Soil Samples, W73-04108	2G
A Comparative Study of the Inactivation of Viruses in Water by Chlorine, W73-03991	5F	The Output of a Lowland Catchment, W73-04533	3B	WHEAT-M Geographical Variations in Yield-Weather Relationships Over A Large Wheat Growing Region, W73-04171	3F
The Role of the Specialist Water Treatment Company, W73-04002	5F	WATER YIELD IMPROVEMENT Development of Economic Water Harvest Systems for Increasing Water Supply - Phase II, W73-03901	3B	Effect of Irrigation, Fertilization and Plowing Depth on Quantity of White Wheat and Maize, W73-04267	3F
Method and Apparatus for Softening or Desalting Water by Ion Exchange, W73-04133	3A	WATERSHED MANAGEMENT Non-Point Source Pollution From Agricultural, Rural, and Developing Areas. W73-04462	5B	WHEAT SEEDS Water Absorption by Wheat Seeds as Influenced by Hydraulic Properties of Soil, W73-04172	3F
Reverse Osmosis Water Purifier, W73-04135	3A	Savannah River Basin Inspection. W73-04472	6E	WHITEWATER RIVER (INDIANA AND OHIO) East Fork of Whitewater River, Indiana and Ohio (Final Environmental Impact Statement). W73-04458	8A
Method and Apparatus for Water Softening, W73-04145	3A	WATERSHEDS (BASINS) Flood Forecasting in the Upper Midwest - Data Assembly and Preliminary Analysis, W73-03906	4A	WILD AND SCENIC RIVERS ACT Authorizing the Study of a Segment of Colorado for Possible Inclusion in the Wild Rivers System. W73-04464	6E
Water Purification for Beverage Processing, W73-04170	5F	A New Topological Relationship as an Indicator of Drainage Network Evolution, W73-04203	4A	WILD RIVER ACT Authorizing the Study of a Segment of Colorado for Possible Inclusion in the Wild Rivers System. W73-04464	6E
Australian Sirotherm Process Removes Salt from Brackish Water, W73-04285	5F	WAVELENGTHS Wave Climate Study: Great Lakes and Gulf of St. Lawrence--Volume II, Appendices A, B, and C, W73-04103	2H	WILLAMETTE VALLEY (ORE) Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102	5B
Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters, W73-04390	5F	WAVES (WATER) Amplification Criterion of Gradually Varied, Single Peaked Waves, W73-04097	8B	WINYAH BAY (SC) A Reconnaissance of the Winyah Bay Estuarine Zone, South Carolina, W73-04095	7C
Cooling Water Chlorination and Productivity of Entrained Phytoplankton, W73-04427	5F	Wave Climate Study: Great Lakes and Gulf of St. Lawrence--Volume II, Appendices A, B, and C, W73-04103	2H	WISCONSIN Dry Graphite Film Protects Treatment Plant Units. W73-04444	8G
WATER USES		Wave Effect and Eddy Diffusivity in the Air near Water Surface, W73-04209	2E	Murrells Inlet, South Carolina: Northport Harbor, Wisconsin. W73-04453	6E
Beneficial Uses of Waste Heat - An Evaluation, W73-04351	5G	Exact Nonlinear Model of Wave Generator, W73-04220	2E	WITHDRAWAL Elevation Changes Due to Tides, Long Beach, Calif., W73-04369	4B
WATER UTILIZATION		Simple Waves on Shear Flows: Similarity Solutions, W73-04539	2E	WOODY PLANTS Method for the Direct Measurement of Absolute Water Consumption of Woody Plants (In German), W73-04177	21
Regional Development of Public Water Supply Systems, W73-04064	3D	The Interaction of Large Amplitude Shallow-Water Waves With an Ambient Shear Flow: Non-Critical Flows, W73-04540	2E	X-RAY ANALYSIS The Structure of Liquid Water, W73-03903	2K
Stochastic Structure of Water Use Time Series, W73-04098	4A	WEATHERING (ROCKS) Lichenometric Indication of the Time of Exposure of a Rock Substrate, (In Russian), W73-04334	7B		
Ground Water in the Plaquemine-White Castle Area, Iberville Parish, Louisiana, W73-04502	4B	WEIRS Method and Apparatus for Clarifying Liquids, W73-04152	5D		
Water Resources of Union Parish, Louisiana, W73-04503	4B				
Water Resources of Ouachita Parish, Louisiana, W73-04504	4B				
WATER VAPOR					
Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102	5B				
Reduction of Atmospheric Toluene Diisocyanate by Water Vapor, W73-04184	5B				
WATER WELLS					
Ground-Water Levels in the South Platte River Valley of Colorado, 1968-72, W73-04211	7C				

AUTHOR INDEX

ADAMS, G. B. Hydrographic Survey of the Galveston Bay System, Texas 1963-66, W73-04190	2L	ALMODOVAR, L. R. Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico, W73-04241	5C	ARTHUR, D. R. Lampreys and Teleost Fish, Other than Whitebait, in the Polluted Thames Estuary, W73-04262	5C
ADAMS, J. R. Marine Life in the Morro Bay Power Plant Discharge Canal, W73-04031	5C	ALWI, SYED A Shellfish-Borne Cholera Outbreak in Malaysia, W73-04182	5C	ASHBURNER, P. A. An Evaluation of Procedures for Enumerating Bacteria in Activated Sludge, W73-04450	5A
ADYALKAR, P. G. An Attempt at Estimating the Transmissibilities of Trappean Aquifers from Specific Capacity Values, W73-04527	2F	AMAR, P. K. Rheology of Friction-Reducing Polymer Solutions, W73-03913	8B	ASHE, G. W. T. Wave Climate Study: Great Lakes and Gulf of St. Lawrence—Volume II, Appendices A, B, and C, W73-04103	2H
ALBERT, H. E. Eden Preserved, W73-04466	5G	AMBERG, H. R. Water Pollution Control in Pulp and Paper Industry, W73-04424	5D	AUKLAND, J. C. Multi-Sensor Oil Spill Detection, W73-03946	5B
ALDERDICE, D. F. Effects of Acclimation and Acute Temperature Experience on the Swimming Speed of Juvenile Coho Salmon, W73-04243	5C	AMEIN, M. Streamflow Routing (With Applications to North Carolina Rivers), W73-03908	4A	AUSTIN, A. P. A Method of Collecting Periphyton in Lentic Habitats with Procedures for Subsequent Sample Preparation and Quantitative Assessment, W73-04270	2L
ALDERDICE, D. S. Species Identification in Visible-Ultraviolet Vapor, W73-04418	5A	AMENT, E. P. Bathymetric Reconnaissance of Marlette and Spooner Lakes, Washoe County and Carson City, Nevada, W73-04100	7C	AUXIER, J. A. Outcry Over Exposure Guidelines, W73-04314	5G
ALEVA, N. I. Some Features of the Mountain Steppe Soils of Trans-Ili and Dzhungarian Ala-Tau in Connection with Erosion (In Russian), W73-04281	2G	ANDERSEN, J. R. Studies of the Influence of Lagoons and Landfills on Groundwater Quality, W73-04066	5B	AVERY, K. R. Literature Search for Atmospheric Humidity Profile Models from the Sea Surface to 1,000 Meters, W73-04332	7C
ALESSI, J. Effect of Nitrogen Source on Corn and Bromegrass Production, Soil pH, and Inorganic Soil Nitrogen, W73-04173	3F	ANDERSEN, K. J. Evaluation of Herbicides for Possible Mutagenic Properties, W73-04233	5C	AVERYANOV, V. G. Use of New Glacier Investigation Techniques in Antarctica (Primeneniye novykh metodov givatologicheskikh issledovanii v Antarktide), W73-04509	2C
ALI, H. I. Effect of Turbulence on BOD Testing, W73-04443	5D	ANDERSON, D. Effects on Freshwater Fish, W73-04236	5C	AYZENBERG, M. M. Particle Size of Mudflows on Carpathian Rivers in the Ukraine (Granulometricheskiy sostav selyeckiy otlozhenii na rekakh Ukrainskikh Karpat), W73-04119	2E
ALI, S. A. Red Sea Drillings, W73-04193	2J	ANDERSON, J. P. E. Effects of Various Soil Fungi and Insecticides on the Capacity of <i>Mucor alternans</i> to Degrade DDT, W73-04232	5B	BACCI, V. The Polluted Waters in Umbria: III. The River Nestore, (In Italian), W73-04393	5B
ALIZAI, H. U. Effects of Soil Texture on Evaporative Loss and Available Water in Semi-Arid Climates, W73-03952	2D	ANDERSON, S. J. Cooling Water Chlorination and Productivity of Entrained Phytoplankton, W73-04427	5F	BAILEY, D. A. Tannery Effluents and Their Treatment-Conclusion, W73-04488	5D
ALLAWAY, W. H. Vanadium Determination in Biological Materials at Nanogram Levels by a Catalytic Method, W73-04409	5A	ANDREEVA, N. L. Lysimetric Method of Examining the Degree of Dehelminthization of Sewage (In Russian), W73-04448	5D	BAILEY, D. A. Tannery Effluents and Their Treatment - Part I, W73-04550	5D
ALLEN, C. F. Use of Potassium Phthalimide for Identification of Alkylene Bis Halides and Bis Sulfonates, W73-04416	5A	ANNAMBHOTLA, V. S. S. Statistical Properties of Missouri River Bed Forms, W73-04365	8B	BAILEY, R. O. Finite-Element Stress Analysis of Avalanche Snowpacks, W73-03928	2C
ALLEN, D. M. Comparison of Multiple Regression and Principal Component Regression for Predicting Water Yields in Kentucky, W73-04199	4A	ANNESTRAND, S. A. Radio Interference From HVDC Converter Stations, W73-04084	8C	BAKER, D. G. Flood Forecasting in the Upper Midwest - Data Assembly and Preliminary Analysis, W73-03906	4A
ALLEN, O. C. Water Treatment Plant for Today and Tomorrow, W73-04435	5D	APIDIANAKIS, J. C. Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant, W73-04311	5A	BAKULINA, A. G. Evaluation of Size of Organic Substance Losses During Steaming of Natural Waters (In Russian), W73-04521	5G
ALLISON, G. B. Comparison of Recharge to Groundwater Under Pasture and Forest Using Environmental Tritium, W73-04373	2F	APPMAN, R. P. Estimating Discharge from Superelevation in Bends, W73-04219	8B		

AUTHOR INDEX

BALANIN, V. V.

BALANIN, V. V.
Utilization of Deep Water Heat in Reservoirs
for the Maintenance of Unfrozen Water Areas,
W73-04034 2C

BALLANCE, W. C.
Water Inflow into Hole UA-1, Amchitka
Island, Alaska, W73-03919 5A

BARBER, T. R.
Mercury Concentration in Recent and Ninety-
Year-Old Benthopelagic Fish, W73-04122 5B

BARFIELD, B. J.
Erosion Sediment Production, W73-04358 2J

**Rainfall and Runoff in Urban Areas: Theory
and Prediction,** W73-04357 4C

BARKER, R. D.
Methods for the Calculation of True Formation
Factors in the Bunter Sandstone of Northwest
England, W73-04534 2F

BARNES, C. S.
High Sensitivity Thermochemical Analysis,
W73-04420 7B

BARNES, E. D.
Common Potato Scab: Effects of Irrigation,
Manganese Sulphate and Sulphur Treatments
for Common Potato Scab on Mineral Composition
of Plant Material and Soil Extracts,
W73-04168 5G

**Effects of Irrigation, Manganese Sulphate and
Sulphur Applications on Common Scab of the
Potato,** W73-04167 5G

BARNES, S. S.
Stable Element Concentrations and Estimations
of the Radionuclide Contents in the Fish and
Invertebrates Sampled from the Waters Ad-
jacent to Panama and Columbia,
W73-04307 5C

BARTON, C. J.
The 1971 Tritium Symposium at Las Vegas,
W73-04318 5A

BASTIAANSE, A. G.
Liquid Treatment Method,
W73-04138 5D

BASTIDAS, O.
Forms of Nitrogen in the Volcanic Soils of
Sibundoy (In Spanish), W73-04032 5B

BAY, C. A.
Remote Sensing of the Arctic Ice Environment,
W73-03938 7B

BEALL, S. E. JR
Agricultural and Urban Uses of Low-Tempera-
ture Heat, W73-04349 5G

BEARD, J. B.
Postharvest Cultural Practices Affecting the
Rooting of Kentucky Bluegrass Sods Grown on
Organic and Mineral Soils, W73-04175 3F

BEDFORD, J. W.
The Uptake of Insecticides by Freshwater
Mussels and the Effects of Sublethal Concen-
trations of Insecticides on These Mussels,
W73-03904 5C

BEETEM, W. A.
Water Inflow into Hole UA-1, Amchitka
Island, Alaska, W73-03919 5A

BEETON, A. M.
The Eutrophication Problem,
W73-04403 5C

BELL, R. A.
Combination Urban-Power Systems Utilizing
Waste Heat, W73-04350 5G

BELLA, D. A.
Finite-Difference Convection Errors,
W73-03997 2E

BELOUSOVA, I. M.
Application of Lasers to Investigation of Glaci-
er Movement (Issledovaniye dinamiki dviz-
heniya lednikov s pomoshch'yu lazern),
W73-04518 2C

BENES, P.
On the State of Mercury (II) Traces in Aqueous
Solutions - Colloidal Behavior of Mercury,
W73-04126 5A

BERAN, M. A.
An Index of Flood-Producing Rainfall Based on
Rainfall and Soil Moisture Deficit,
W73-04528 2A

BERG, G.
A Comparative Study of the Inactivation of
Viruses in Water by Chlorine,
W73-03991 5F

BERG, R. E.
Electrochemical Oxygen Demand System,
W73-04147 5A

BERGLES, J. L.
Sewage Treatment Plant and Method of Treat-
ing Sewage,
W73-04130 5D

BERTILSSON, G.
Topsoil Reaction to Mechanical Pressure,
W73-04057 2G

BESIK, F.
Reverse Osmosis for Wastewater Treatment,
W73-04487 5D

BEWTRA, J. K.
Effect of Turbulence on BOD Testing,
W73-04443 5D

BEYERLEIN, F. H.
Influence of Amalgam Formation on Cyclic
Volammetry,
W73-04410 5A

BHATTACHARYYA, C. R.
Combined Ion Exchange-Solvent Extraction
(Ciese) Studies of Metal Ions on Ion Exchange
Papers,
W73-04414 5A

BIACHE, A. JR
Remote Sensing of the Arctic Ice Environment,
W73-03938 7B

BIANCHI, W. C.
Rapid Measurement of Hydraulic Conductivity
Changes in Slowly Permeable Soils,
W73-03968 2G

BIDDLE, J. W.
Salmonelle as an Index of Pollution of Surface
Waters,
W73-04426 5A

BIELY, J.
Dehydrated Poultry Waste in Poultry Rations,
W73-03992 5E

BIGGAR, J. W.
Horizontal Infiltration into Layered Soils,
W73-04092 2G

BIGGS, R. B.
Sedimentation on Shell Banks in Delaware
Bay,
W73-04226 2L

BISHOP, C. T.
An Investigation into the Determination of Plu-
tonium in Soil by a Fusion Procedure,
W73-04295 5B

BISWAS, H. K.
Extraction of Anions into Chloroform by Sur-
factant Cations. Relevance to Dye Extraction
Method of Analysis of Long Chain Amines,
W73-04408 5A

BLACK, J. D. F.
Determination of a Water Table in a Soil
Profile Using the Platinum Oxygen Cathode,
W73-03985 2G

BLAHM, T. H.
Thermal Effects Studies on the Lower Colum-
bius River, 1968-70,
W73-04331 5C

BLAIR, A. M.
Environmental Aspects of High Voltage Subs-
stations,
W73-04080 8C

BLAIR, R. L.
Treating Liquid Waste Effluent,
W73-04150 5D

BLASCO, M.
Forms of Nitrogen in the Volcanic Soils of
Sibundoy (In Spanish),
W73-04032 5B

BLOMEKE, J. O.
Radioactive Waste Repository Project; Annual
Progress Report for Period Ending September
30, 1972,
W73-04294 5B

BLYTHE, P. A.
The Interaction of Large Amplitude Shallow-
Water Waves With an Ambient Shear Flow:
Non-Critical Flows,
W73-04540 2E

BOBB, W. H.
Effects of Proposed Runway Extensions at
LaGuardia Airport on Tides, Currents, Shoal-
ing, and Dye Dispersion,
W73-04096 8B

BOCH, A. L.
Radioactive Waste Repository Project; Annual
Progress Report for Period Ending September
30, 1972,
W73-04294 5B

AUTHOR INDEX

BURKE, J. C.

- BODEAUX, A.**
Interception of Rain by Forest Vegetation-Estimation of Daily Interception Using a Mathematical Model (Interception de la pluie par la vegetation forestiere—estimation de l'interception journaliere a l'aide d'un modele mathematique),
W73-04350 2A
- BOESCH, B. E.**
Urban Erosion—Practical Alternatives,
W73-04359 4D
- BOGORODSKIY, V. V.**
Application of Lasers to Investigation of Glaci-er Movement (Issledovaniye dinamiki dvizheniya lednikov s pomoshch'yu lazera),
W73-04518 2C
- Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'-zovaniya lazerov dlya issledovaniya dinamiki lednikovykh pohrovov),
W73-04510 2C
- BOLANDER, W. J.**
Agriculturally-Polluted Irrigation Water as a Source of Plant-Parasitic Nematode Infestation,
W73-03954 5B
- BOLEN, J. J.**
Seasonal Concentration, Turnover, and Mode of Accumulation of p32 by the Juvenile Starry Flounder in the Columbia River Estuary, *Platichthys Stellatus* (Pallas),
W73-04322 5C
- BOND, T. E.**
Sprinkler use for Swine Cooling,
W73-04266 3E
- BONEH, A.**
Properties of the Kernels for Time Invariant, Initially Relaxed, Second Order, Surface Runoff Systems,
W73-04371 2A
- BONNER, W. D.**
Use of Surface Observations in Boundary-Layer Analysis,
W73-04333 7C
- BONTEMPO, M.**
Automatic Designing of Transmission Lines and Substations,
W73-04079 8C
- BONTOYON, W. R.**
Thin Layer Chromatographic Detection of Chlorinated Hydrocarbons as Cross-Contami-nants in Pesticide Formulations,
W73-04396 5A
- BOORUYJ, S.**
Tertiary Filtering Arrangement,
W73-04144 5D
- BORDELON, B. R.**
Adsorption and Concentration of Dissolved Carbon-14-DDT by Coloring Colloids in Sur-face Waters,
W73-04012 5B
- BORODKIN, B. S.**
Utilization of Deep Water Heat in Reservoirs for the Maintenance of Unfrozen Water Areas,
W73-04034 2C
- BORON, N. J.**
A Survey of Attitudes Towards the Mississippi River as a Total Resource in Minnesota,
W73-03905 6B
- BOTHMA, J. DU P.**
Notes on River Habitat Use by the Larger Uni-gulates in the Kalahari Gemsbok National Park,
W73-04273 2I
- BOTTFENFIELD, B. F.**
Radioactive Waste Repository Project; Annual Progress Report for Period Ending September 30, 1972,
W73-04294 5B
- BOURDEAUX, J. E.**
Red Sea Drillings,
W73-04193 2J
- BOURKE, R. H.**
Coastal Currents of Pacific Northwest,
W73-04364 5B
- BOWEN, V. T.**
Shallow-Water Strontium-90 Anomaly About the Antilles Arc-1970,
W73-04293 5B
- BOWERMAN, F. R.**
Marina Del Rey: A Study of Environmental Variables in a Semi-Enclosed Coastal Water,
W73-04197 5B
- BOWERS, C. E.**
Flood Forecasting in the Upper Midwest - Data Assembly and Preliminary Analysis,
W73-03906 4A
- BRADFORD, P. A.**
Radiocarbon in the Sea,
W73-04292 5B
- BRADIE, R.**
Remote Sensing of the Arctic Ice Environment,
W73-03938 7B
- BRAMSON, P. E.**
Environmental Surveillance at Hanford for CY-1971,
W73-04310 5A
- BRAR, S. S.**
Radiological Physics Division Annual Report. Environmental Research, Jan.-Dec. 1971,
W73-04303 5A
- BRAUN, H. J.**
Method for the Direct Measurement of Ab-solute Water Consumption of Woody Plants (In German),
W73-04177 2I
- BRETHERTON, F. P.**
Stability and the Conservation of Mass in Drainage Basin Evolution,
W73-04202 2A
- BRIDGES, W. C.**
Flood of September 20-23, 1969, in the Gadsden County Area, Florida,
W73-04535 2E
- BRINCK, W.**
Radiological Surveillance at Pressurized Water Reactors,
W73-04325 5B
- BRONZINI, M. S.**
Planning for Coastal Ports on a Systems Basis: Preliminary Methodological Design,
W73-04525 8A
- BROOKS, J.**
Oil Spillage Control Process,
W73-04129 5G
- BROUZE, P.**
Study of the Metabolization of Pollutant Products,
W73-04402 5B
- BROWER, R.**
An Experimental Model for Automated Detec-tion, Measurement and Quality Control of Sea-Surface Temperatures From ITOS-IR Data,
W73-03940 7C
- BROWN, D. H.**
Combined Steam Power Plant and Water Distil-lation System,
W73-04140 3A
- Trends of Power Generation and Thermal Discharges in New York State,
W73-04338 5G
- BROWN, J.**
Performance of a Frost-Tube for Determination of Soil Freezing and Thawing Depths,
W73-04254 7B
- BROWN, S-D.**
A Method of Collecting Periphyton in Lentic Habitats with Procedures for Subsequent Sample Preparation and Quantitative Assessment,
W73-04270 2L
- BROWN, W. L.**
A Method for Calculating Water Depth, At-tenuation Coefficients and Bottom Reflectance Characteristics,
W73-03941 7B
- BRUCKL, E.**
A Model of a Surging Glacier,
W73-03933 2C
- BRUTSAERT, W.**
Some Generalized Characteristics of the Floods and Droughts of the Lower Mekong,
W73-04380 2E
- Wave Effect and Eddy Diffusivity in the Air near a Water Surface,
W73-04209 2E
- BRUVOLD, W. H.**
Data Record for Public Attitudes Toward Reuse of Reclaimed Water,
W73-04059 6B
- BULLOCK, C. W.**
Before and After Studies of the Effects of a Power Plant Installation on Lake LBJ - Mea-surement and Prediction of Abnormal Reser-voir Operations on Lake LBJ's Water Quality,
W73-04336 5B
- BULTOT, F.**
Interception of Rain by Forest Vegetation-Estimation of Daily Interception Using a Mathematical Model (Interception de la pluie par la vegetation forestiere—estimation de l'interception journaliere a l'aide d'un modele mathematique),
W73-04530 2A
- BURGNER, R. L.**
Limnology and Fish Ecology of Sockeye Salmon Nursery Lakes of the World,
W73-04405 5C
- BURKE, J. C.**
Shallow-Water Strontium-90 Anomaly About the Antilles Arc-1970,
W73-04293 5B

AUTHOR INDEX

BURNETT, E.

BURNETT, E.
Water Movement in Undisturbed Swelling Clay
Soil,
W73-04089

2G

BUSCH, W. H.
3-Stage Ponds Earn Plaudits,
W73-04438

5D

BUSECK, P. R.
Mercury Detection by Means of Thin Gold
Films,
W73-04123

5A

BUTLER, H. M.
The 1971 Tritium Symposium at Las Vegas,
W73-04318

5A

BUTLER, S. S.
Nonuniform Groundwater-Conduit Discharge
and Head Loss,
W73-04362

2F

CAHILL, W. J.
Combination Urban-Power Systems Utilizing
Waste Heat,
W73-04350

5G

CAICEDO, A.
Forms of Nitrogen in the Volcanic Soils of
Sibundoy (In Spanish),
W73-04032

5B

CAIRNS, J. JR.
Coping with Heated Waste Water Discharges
from Steam-Electric Power Plants,
W73-04026

5C

CALANDRO, A. J.
Water Resources of Ouachita Parish, Louisiana,
W73-04504

4B

Water Resources of Union Parish, Louisiana,
W73-04503

4B

CALDECOTT, R.
Electromagnetic Pulse Sounding for Surveying
Underground Water,
W73-03912

7B

CALLENDER, E.
Environmental Chemistry: Grand River Studies,
W73-04305

5B

CAMPBELL, B. H.
Reduction of Aromatic Fluorine Compounds,
W73-04412

5B

CAPOMACCHIA, A. C.
Electronic Spectra of 2-Aminoquinoline and 4-Aminouquinoline. Evidence for the Cyclic Amidine Structure of the Singly Protonated Cations,
W73-04389

5A

CAPPADONA, C.
Measurements of Movements of Solid Substances in Water by Means of Stable Tracers and Activation Analysis,
W73-04490

5B

CARLMARK, J. W.
Penetration of Free-Falling Objects Into Deep-Sea Sediments,
W73-04195

2J

CARPENA, A.
New Structural Designs for H. V. Transmission Towers,
W73-04078

8C

CARPENTER, E. J.
Cooling Water Chlorination and Productivity of Entrained Phytoplankton,
W73-04427

5F

CARR, P. W.
High Sensitivity Thermochemical Analysis,
W73-04420

7B

PERCHLORATE DETERMINATION
Perchlorate Determination by Thermometric
Enthalpy Titration,
W73-04230

5A

CARRINGTON, E. G.
An Evaluation of Procedures for Enumerating Bacteria in Activated Sludge,
W73-04450

5A

CARROLL, J. L.
Planning for Coastal Ports on a Systems Basis:
Preliminary Methodological Design,
W73-04525

8A

CARSON, B.
Analysis of Turbidite Correlation in Cascadia Basin, Northeast Pacific Ocean,
W73-04249

5B

CARSON, C. D.
The Effect of Electrolyte Composition on Hydraulic Conductivity of Certain Texas Soils,
W73-03986

2G

CARTER, D. A.
Protective Measures for Cooling Systems in Keeping with Water Quality Standards,
W73-04018

5D

CARTWRIGHT, K.
Electrical Earth Resistivity Surveying in Landfill Investigations,
W73-03918

5B

CARUSO, S. C.
Chromatographic Detection of Water Contaminants,
W73-04423

5A

CASEY, H. E.
Salinity Problems in Arid Lands Irrigation: A Literature Review and Selected Bibliography,
W73-03910

3C

CASSAI, N.
Irrigation Guesswork - Goodbye,
W73-03962

3F

CECIL, E. J.
A Survey of Attitudes Towards the Mississippi River as a Total Resource in Minnesota,
W73-03905

6B

CHADWICK, D. G.
On-Site Digital Accumulation and Storage of Hydrologic Data for Use in Data Acquisition Systems,
W73-04067

7C

CHALENKO, V. G.
Investigation of the Possibility of Artificial Control of the Rate of Evaporation from Soils (In Russian),
W73-04013

2D

CHANDRASEKKARAN, A. R.
Behavior of Koyna Dam-Dec. 11, 1967 Earthquake,
W73-04076

8E

CHANG, S. L.
A Comparative Study of the Inactivation of Viruses in Water by Chlorine,
W73-03991

5F

CHAPLIN, J. R.
Computer Model of Vortex Shedding from a Cylinder,
W73-04216

8B

CHAPMAN, W. H.
Concentration Factors of Chemical Elements in Edible Aquatic Organisms,
W73-04125

5C

CHASE, E. B.
Fluvial-Sediment Discharge to the Oceans from the Contiguous United States,
W73-04526

2J

CHEIPETZ, A. S.
Combination Urban-Power Systems Utilizing Waste Heat,
W73-04350

5G

CHEM, K. Y.
Marina Del Rey: A Study of Environmental Variables in a Semi-Enclosed Coastal Water,
W73-04197

5B

CHENG, I-MING
Wave Effect and Eddy Diffusivity in the Air near a Water Surface,
W73-04209

2E

CHERRY, W. B.
Salmonellae as an Index of Pollution of Surface Waters,
W73-04426

5A

CHESMORE, A. P.
A Study of the Marine Resources of Dorchester Bay,
W73-04189

6C

CHIU, S. Y.
Kinetic Behavior of Mixed Populations of Activated Sludge,
W73-04441

5D

CHRISTIANSON, A. G.
Beneficial Uses of Waste Heat - An Evaluation,
W73-04351

5G

CHU, C. S.
Impact of Cooling Water on Lake Temperatures,
W73-04037

5B

CHUAH, H. H.
Factors Affecting Plant Uptake and Phytotoxicity of Cadmium Added to Soils,
W73-04058

5B

CLAESY, R. R.
Large, Inexpensive Oven used to Decontaminate Glassware for Environmental Pesticide Analysis,
W73-04394

5A

CLAPPERTON, C. M.
The Pleistocene Moraine Stages of West-Central Peru,
W73-03931

2C

CLARK, T. M.
Reverse Osmosis Water Purifier,
W73-04135

3A

CLUFF, C. B.
Development of Economic Water Harvest Systems for Increasing Water Supply - Phase II,
W73-03901

3B

AUTHOR INDEX

COFFMAN, D. M. A New Topological Relationship as an Indicator of Drainage Network Evolution, W73-04203	CRADDOCK, D. R. Thermal Effects Studies on the Lower Columbia River, 1968-70, W73-04331	DANILOV, O. B. Application of Lasers to Investigation of Glaciation Movement (Issledovaniye dinamiki dvizheniya lednikov s pomoshch'yu lazera), W73-04518
COLE, J. A. Some Single- and Multi-Site Models of Rainfall Within Discrete Time Increments, W73-04372	CRAFT, T. F. Evaluation of Treatment Plants by Tracer Methods, Annual Report, Jan. 1971-Jan. 1972, W73-04297	DAVIS, A. R. Computer-Aided Visual Spectrum Analysis, W73-04234
COLEBROOK, M. The Instability of Ocean Populations, W73-04240	CRAIL, J. D. Automatic Treatment of Cooling Water, W73-04422	DAVIS, D. R. Flood of September 20-23, 1969, in the Gadsden County Area, Florida, W73-04535
COLEMAN, R. Red Sea Drills, W73-04193	CRAWFORD, B. E. Species Identification in Visible-Ultraviolet Vapor, W73-04418	DE, A. K. Combined Ion Exchange-Solvent Extraction (Ciese) Studies of Metal Ions on Ion Exchange Papers, W73-04414
COLLINS, S. G. Survey of the Rusty Glacier Area, Yukon Territory, Canada, 1967-70, W73-03932	CROSS, F. A. Mercury Concentration in Recent and Ninety-Year-Old Benthopelagic Fish, W73-04122	DE GOELJ, J. J. M. Activation Analysis Trace-Element Studies for Marine Biological Samples, W73-04327
COLON, J. A. Radiological Physics Division Annual Report, Environmental Research, Jan.-Dec. 1971, W73-04303	CULBERTSON, J. K. Fluvial-Sediment Discharge to the Oceans from the Conterminous United States, W73-04526	MERCURY IN FISH - IMPORTED TINNED FISH, (IX. KWIKGEHALDEN VAN EEN AANTAL SORTEN INGEBLIKTE VIS), W73-04045
COLVILLE, J. S. Water Table Fluctuations Under Forest and Pasture in a Karstic Region of Southern Australia, W73-04374	CUMMING, R. B. The 1971 Tritium Symposium at Las Vegas, W73-04318	DE SOMER, M. The Lateral Inflow into Submerged Drains, W73-04384
CONSTANTIN, G. K. Soil Hydraulic Conductivity and Bulk Volume Changes During Cyclic Calcium-Sodium Exchange, W73-03965	CUMMINGS, J. P. Electrochemical Oxygen Demand System, W73-04147	DE TROCH, F. The Lateral Inflow into Submerged Drains, W73-04384
COOPER, K. H. Our Mangroves Threatened, W73-04263	CURTIS, M. L. An Investigation into the Determination of Plutonium in Soil by a Fusion Procedure, W73-04295	DE VOS, R. H. Mercury in the Environment - Techniques of Analysis (XIII. Analysetechnieken voor Kwik in Het Milieu), W73-04046
CORLEY, J. P. Environmental Surveillance at Hanford for CY-1971, W73-04310	CURTIS, W. F. Fluvial-Sediment Discharge to the Oceans from the Conterminous United States, W73-04526	DEE, P. A. Analytical Technique May Cut Oil Spills, W73-04429
COTTARELLI, V. A New Species of Parastenocaris (Crustacea, Copepoda) of the Hyporheic Ground Water of the Liscia River (Sardinia), (In Italian), W73-04378	CUTKOMP, L. K. Inhibition of Oligomycin-Sensitive and -Insensitive Magnesium Adenosine Triphosphate Activity in Fish by Polychlorinated Biphenyls, W73-04176	DEGUZMAN, A. Studies on Variants of <i>Bacillus Stearothermophilus</i> Strain NCA 1518, W73-04246
COTTON, N. Microbes as Tracers of Water Movement, W73-04392	CUTSHALL, N. Ecological Studies of Radioactivity in the Columbia River Estuary and Adjacent Pacific Ocean, Progress Report, July 1, 1971-June 30, 1972, W73-04299	DEILER, F. G. Pollution Control in Sulphur Mining, W73-04498
COUTANT, C. C. Biological Limitations on the Use of Waste Heat in Aquaculture, W73-04342	DAHLING, D. A Comparative Study of the Inactivation of Viruses in Water by Chlorine, W73-03991	DELLAMONICA, E. S. Efficiency of <i>Salmonella</i> Isolation from Meat- and Bone Meal of One 300-g Sample Versus Ten 30-g Samples, W73-04247
INDEXED BIBLIOGRAPHY OF THERMAL EFFECTS LITERATURE - 2, W73-04353	DALY, L. M. An Inventory of the Ponds, Lakes and Reservoirs of Massachusetts, Berkshire and Franklin Counties, W73-04069	DELLEUR, J. W. Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries, W73-04063
COVER, A. E. Optimizing an Activated Carbon Wastewater Treatment Plant, W73-04421	DAHERD, G. T. Combination Urban-Power Systems Utilizing Waste Heat, W73-04350	DELMONTE, R. C. Forces Exerted by Waves Breaking Seaward of a Vertical Seawall, W73-03925
COX, R. G. Pertinent Data on Spillway Tainter Gates for Corps of Engineers Projects, W73-04377	DANIELS, R. B. Iron and Silica in Water, Acid Ammonium Oxalate, and Dithionite Extracts of Some North Carolina Coastal Plain Soils, W73-04088	DEREMER, E. D. Starting with Trickle Irrigation, W73-03938

AUTHOR INDEX

DESAIAH, D.

Inhibition of Oligomycin -Sensitive and -Insensitive Magnesium Adenosine Triphosphate Activity in Fish by Polychlorinated Biphenyls,
W73-04176
5C

DESBRAUMES, E.
Determination of Hydrocarbon Residues in Water,
W73-04007
5A

DEVIRTS, A. L.
Concentration of C-14 in the Troposphere During 1953 to 1971, (In Russian),
W73-04323
5A

DEVRIES, R. N.
Sensitivity of Groundwater Flow Models to Vertical Variability of Aquifer Constants,
W73-04065
2F

DI TORO, D. M.
Line Source Distributions in Two Dimensions: Applications to Water Quality,
W73-04201
5B

DAZ-FIERROS, F.
Evapotranspiration and Potential Evapotranspiration Measures in Santiago de Compostela (Spain),
W73-04028
2D

DICKIEY, B.
Inline Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment,
W73-04161
5D

DICKINSON, W. T.
A Sampling Scheme for Shallow Snowpacks,
W73-04386
7B

DIETHORN, W. S.
The Dose to Man from Atmospheric KR-85,
W73-04291
5B

DIETRICH, W. C.
Reduces Effluent from Blanching,
W73-04163
5D

DINKINS, C. E.
Texas Seashore Boundary Law: The Effect of Natural and Artificial Modifications,
W73-04460
6E

DESKIN, M. H.
Properties of the Kernels for Time Invariant, Initially Relaxed, Second Order, Surface Runoff Systems,
W73-04371
2A

DIXON, R. M.
Soil Air Pressure and Water Infiltration Under Border Irrigation,
W73-04087
2G

DOBKINA, E. I.
Concentration of C-14 in the Troposphere During 1953 to 1971, (In Russian),
W73-04323
5A

DOLLIMORE, D.
The Optimum Flocculant Concentration for Effective Flocculation of China Clay in Aqueous Suspension,
W73-04477
5D

DONOHUE, J. M.
Cooling Water Treatment-Where Do We Stand,
W73-04016
5D

PROTECTIVE MEASURES FOR COOLING SYSTEMS IN KEEPING WITH WATER QUALITY STANDARDS
W73-04018
5D

DOROGAN, V. F.
Agrophysical Characteristics of Ordinary Chernozems in Eastern Kazakhstan, (In Russian),
W73-03996
2G

DOUGLASS, J. E.
Predicting Soil Moisture in the Southern Appalachians,
W73-04086
2G

DOWELL, A. U.
Environmental Aspects of High Voltage Substations,
W73-04080
8C

DOWNING, A. L.
Effluent Standards and the Assessment of the Effects of Pollution on Rivers,
W73-04494
5G

DOYLE, M. J.
Surface Water Movement Studies Utilizing a Tracer Dye Imaging System,
W73-03943
7B

DROZD, N. I.
Effect of Karst on Floods on Left-Bank Tributaries of the Dniester River (Vliyaniye karsta na formirovaniye livnevyykh pavodkov na levoberezhnykh prirodnakh Dnestrakh),
W73-04114
2E

DROZDOVA, Z. K.
Lysimetric Method of Examining the Degree of Dehelminthization of Sewage (In Russian),
W73-04448
5D

DUFFY, M. E.
Birds Give Warning,
W73-04049
5C

DUL'BEVA, E. F.
Moisture Regime of Sod Podzolic Soils in Different Farmlands, (In Russian),
W73-04269
2G

DUNCAN, D. C.
Energy Resources of the United States,
W73-04039
6G

DUNCAN, J. M.
Movements in Dams Due to Reservoir Filling,
W73-04073
8D

DUPRIEZ, G. L.
Interception of Rain by Forest Vegetation-Estimation of Daily Interception Using a Mathematical Model (Interception de la pluie par la vegetation forestiere—estimation de l'interception journaliere a l'aide d'un modele mathematique),
W73-04530
2A

DURKEE, E. L.
Recondition Brine to Cut Pollution,
W73-04160
5D

DUTT, A. K.
A Shellfish-Borne Cholera Outbreak in Malaysia,
W73-04182
5C

DUTT, G. R.
Development of Economic Water Harvest Systems for Increasing Water Supply - Phase II,
W73-03901
3B

DUTTON, R. D.
A Dynamic Programming Study of Various Diversion Losses,
W73-04068
4A

DYSON, W. L.
Reduction of Atmospheric Toluene Dioxycyanate by Water Vapor,
W73-04184
5B

DZHANPEISOV, R.
Some Features of the Mountain Steppe Soils of Trans-Ili and Dzungarian Ala-Tau in Connection with Erosion (In Russian),
W73-04281
2G

EACKER, C. A.
Urban Erosion—Practical Alternatives,
W73-04359
4D

EBERKHARD, G. YA.
Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava),
W73-04512
2J

EDGERTON, A. T.
Microwave Emission From Snow—A Progress Report,
W73-03950
7B

EDGINGTON, D. N.
Environmental Chemistry: Grand River Studies,
W73-04305
5B

EDGINGTON, D. N.
Determination of Selected Trace Elements in Natural Water Samples Using Spark Source Mass Spectroscopy,
W73-04304
5A

EDMONDSON, W. T.
The Eutrophication Problem,
W73-04403
5C

EDWARDS, R. W.
Effluent Standards and the Assessment of the Effects of Pollution on Rivers,
W73-04494
5G

EGAN, J. T.
Trace-Metal Analysis Using Atomic Absorption Spectrophotometry,
W73-04043
5A

EICHHOLZ, G. G.
Evaluation of Treatment Plants by Tracer Methods. Annual Report, Jan. 1971-Jan. 1972,
W73-04297
5B

EKERN, P. C.
Wastewater Reclamation by Irrigation,
W73-04480
5D

ELDER, F. C.
Thermal Scanner Observations over Lake Ontario,
W73-03949
7B

ELGABALY, M. M.
Air Permeability as Related to Particle Size and Bulk Density in Sand System,
W73-03972
2G

ELGHAMRY, W. M.
Air Permeability as Related to Particle Size and Bulk Density in Sand System,
W73-03972
2G

AUTHOR INDEX

GALUSHCHENKO, N. G.

- ELIASON, J. R.**
Surface Water Movement Studies Utilizing a Tracer Dye Imaging System,
W73-03943 7B
- ELLENDER, R. D.**
Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters,
W73-04390 5F
- Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters,
W73-04478 5D
- ELLIOTT, W. P.**
Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon,
W73-04102 5B
- ELLIS, J. H.**
A Rapid Method of Measurement of Diffusion Coefficients in Aqueous Solutions,
W73-03966 2K
- EMERY, W. T.**
Control of Copper Electroplating Wastes: An Annotated Bibliography,
W73-04467 5G
- ENGLAND, B.**
Concentration of Reovirus and Adenovirus From Sewage and Effluents by Protamine Sulfate (Salmine) Treatment,
W73-03995 5D
- ERICKSON, L. E.**
Kinetic Behavior of Mixed Populations of Activated Sludge,
W73-04441 5D
- ESSINGTON, E. H.**
Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report,
W73-04290 5B
- EWART, C. J.**
Some Generalized Characteristics of the Floods and Droughts of the Lower Mekong,
W73-04380 2E
- FAIG, W.**
Photogrammetry and Hydraulic Surfaces,
W73-04368 7B
- FAIRHALL, A. W.**
Radiocarbon in the Sea,
W73-04292 5B
- FAN, L. T.**
Kinetic Behavior of Mixed Populations of Activated Sludge,
W73-04441 5D
- FANG, C. S.**
Streamflow Routing (With Applications to North Carolina Rivers),
W73-03908 4A
- FARMER, L. D.**
Determination of Sea Ice Drift Using Side-Looking Airborne Radar,
W73-03951 7B
- FARRELL, D. A.**
Dynamics of the Soil-Water System During a Rainstorm,
W73-04107 2G
- FAULKNER, L. R.**
Agriculturally-Polluted Irrigation Water as a Source of Plant-Parasitic Nematode Infestation,
W73-03954 5B
- FAWKES, P. E.**
Roughness in a Model of Overland Flow,
W73-04508 8B
- FEDAN, I. Y.**
Water Permeability of Frozen Soil in Connection with Antierosion Conservation Tillage of Fall-Plowed Soil on Slopes, (In Ukrainian),
W73-03916 2G
- FEDOROV, B. A.**
Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'zovaniya laserov dlya issledovaniya dinamiki lednikovykh pohrovov),
W73-04510 2C
- FEITLER, H.**
Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling,
W73-04003 5D
- FERGUSON, J. F.**
A Review of the Arsenic Cycle in Natural Waters,
W73-04541 5B
- FERM, C. W.**
Sewage Treatment System,
W73-04141 5D
- FIELDS, M. L.**
Studies on Variants of *Bacillus Stearothermophilus* Strain NCA 1518,
W73-04246 5A
- FISH, H.**
Effluent Standards and Water Reuse,
W73-04425 5D
- FISHER, H. L.**
Concentration Factors of Chemical Elements in Edible Aquatic Organisms,
W73-04125 5C
- FLEROV, B. A.**
Hydrobionts' Adaptation to a Toxic Factor, (In Russian),
W73-04500 5C
- FLETCHER, B. P.**
Evaluation of Flared Outlet Transitions,
W73-04196 8B
- FOOTE, H. P.**
Surface Water Movement Studies Utilizing a Tracer Dye Imaging System,
W73-03943 7B
- FORSBERG, C. G.**
Algal Assay Procedure,
W73-04404 5A
- FOSBERG, T. M.**
Reclaiming Cooling Tower Blowdown,
W73-04040 5D
- FOSTER, J. B.**
Construction of Waste-Injection Monitor Wells Near Pensacola, Florida,
W73-04536 5E
- FRANEY, G. J.**
Measurement of Suspended Solids Concentrations in Sewage by use of a Depolarization Method,
W73-04185 5A
- FRANZREB, J. K.**
Indexed Bibliography of Thermal Effects Literature - 1,
W73-04020 5C
- FREELAND, W.**
Backflushing Filter,
W73-04151 5D
- FREEMAN, N. C.**
Simple Waves on Shear Flows: Similarity Solutions,
W73-04539 2E
- FRICK, P.**
Learning, External Benefits, and Subsidies in Water Desalination,
W73-04274 6B
- FROMENT, A.**
Concerning Conservation of the Hohe Mark Forest Massif and of the High Valleys of the Schwalm and Its Tributaries at Elisenborn,
W73-04523 6G
- FROST, T. R.**
What is Expected in In-Plant Control and Waste Treatment in the Future,
W73-04437 5D
- FRUH, E. G.**
Before and After Studies of the Effects of a Power Plant Installation on Lake LBJ - Measurement and Prediction of Abnormal Reservoir Operations on Lake LBJ's Water Quality,
W73-04336 5B
- FRYE, J. O.**
An Investigation into the Determination of Plutonium in Soil by a Fusion Procedure,
W73-04295 5B
- FUJITA, M.**
Studies on Purification Theories and Mechanism of Activated Sludge. (IV) Application of Purification Theories to the Activated Sludge Process,
W73-03994 5D
- FUKUNAGA, K.**
Pesticide Regulations and Residue Problems in Japan,
W73-04042 5B
- FUKUOKA, S.**
Longitudinal Dispersion in Sinuous Channels,
W73-04214 5B
- FULLER, R. G.**
Bioenvironmental Safety Studies, Amchitka Island, Alaska. Cannikin D + 2 Months Report,
W73-04317 5C
- FUXELJUS, K.**
Ion Exchange Resin for Removal of Heavy Metal Ions in Waste Water,
W73-04047 5D
- GALUSHCHENKO, N. G.**
Investigation of Storm Runoff on Small Watersheds in Lowlands of the Ukraine (Issledovaniye poter' dozhdevogo stoka na malykh vodosoborakh ravninnoy territorii Ukrayiny),
W73-04113 2E

AUTHOR INDEX

GAMBLE, E. E.

GAMBLE, E. E.
Iron and Silica in Water, Acid Ammonium Oxalate, and Dithionite Extracts of Some North Carolina Coastal Plain Soils,
W73-04088 2G

GANNING, B.
Studies on Chemical, Physical and Biological Conditions in Swedish Rockpool Ecosystems,
W73-04191 2H

GARDNER, W. R.
Measurement of Unsaturated Conductivity and Diffusivity by Infiltration Through an Impeding Layer,
W73-03971 2G

Stomatal Conductance of Differentially Salinized Plants,
W73-04181 3C

Transient Infiltration into Crust-Topped Profiles,
W73-03976 2G

GARGAS, E.
'Sun-Shade' Adaptation in Microbenthic Algae from the Oresund,
W73-04519 5C

GARTON, R. R.
Beneficial Uses of Waste Heat - An Evaluation,
W73-04351 5G

GAUDY, A. F. JR.
Control of Growth Rate by Initial Substrate Concentration at Values Below Maximum Rate,
W73-04499 5C

GAUDY, E. T.
Control of Growth Rate by Initial Substrate Concentration at Values Below Maximum Rate,
W73-04499 5C

GAVIS, J.
A Review of the Arsenic Cycle in Natural Waters,
W73-04541 5B

GAYDOS, M. W.
Water Resources of Ouachita Parish, Louisiana,
W73-04504 4B

GELDREICH, E. E.
Buffalo Lake Recreational Water Quality: A Study in Bacteriological Data Interpretation,
W73-04162 5B

Microbiology of Water,
W73-04235 5B

GERLOFF, G. C.
Stomatal Conductance of Differentially Salinized Plants,
W73-04181 3C

GEVANTMAN, L. H.
Survey of Analytical Spectral Data Sources and Related Data Compilation Activities,
W73-04244 5A

GILLETTE, R. K.
An Investigation into the Determination of Plutonium in Soil by a Fusion Procedure,
W73-04295 5B

GILLS, T. E.

Nuclear Activation Analysis of Se, As, Zn, Cd, and Hg in Environmental Matrices,
W73-04328 5A

GIMMINGHAM, C. H.
Growth Form and Water Relations of Mosses in the Maritime Antarctic,
W73-04259 2C

GISSER, M.
Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W73-04277 6D

GIVENS, R. L.
Sprinkler use for Swine Cooling,
W73-04266 3E

GLANCY, P. A.
Bathymetric Reconnaissance of Mariette and Spooner Lakes, Washoe County and Carson City, Nevada,
W73-04100 7C

GLAUSER, J. P.
Use of Potassium Phthalimide for Identification of Alkylene Bis Halides and Bis Sulfonates,
W73-04416 5A

GLENNE, B.
Coastal Currents of Pacific Northwest,
W73-04364 5B

GLOGOCZOWSKI, M.
Recent Sediments of the Central California Continental Shelf, Pigeon Point to Sand Hills Bluffs: Part B. Mineralogical Data,
W73-03922 2J

GODDARD, B.
An Experimental Model for Automated Detection, Measurement and Quality Control of Sea-Surface Temperatures From ITOS-IR Data,
W73-03940 7C

GOLD, P. I.
Rheology of Friction-Reducing Polymer Solutions,
W73-03913 8B

GOLDING, D. L.
Water Shortage in the Forest Floor of Subalpine Forests of Alberta,
W73-04169 4A

GOLDMAN, G. C.
Use of Fallout Cesium-137 as a Tracer to Define the Recent Deltaic Facies of a River,
W73-04501 2J

GOLOMB, A.
Reverse Osmosis for Wastewater Treatment,
W73-04487 5D

GOODMAN, B. L.
The Case for Higher Rate Waste Water Treatment,
W73-04445 5D

GOOLSBY, D. A.
Construction of Waste-Injection Monitor Wells Near Pensacola, Florida,
W73-04536 5E

GOSWAMI, R.
3-Stage Ponds Earn Pauduits,
W73-04438 5D

GOULTY, G. A.

Environmental Aspects of High Voltage Substations,
W73-04080 9C

GRACE, J. L. JR.
Evaluation of Flared Outlet Transitions,
W73-04196 8B

GRAHAM, E. R.
Isotopic Exchange Studies of Micronutrients in Soils,
W73-03963 2G

GRAHAM, R. P.
Minimizes Fruit Peel Pollution,
W73-04284 5D

GRANT, N.
Legacy of the Mad Hatter,
W73-04048 5C

GRENNEY, W. J.
Finite-Difference Convection Errors,
W73-03997 2E

GREVE, P. A.
Mercury in Fish - Total Content in Freshwater and Marine Fishes (VII. (Total) Kwikgehalte van Zeevissen),
W73-04044 5C

GRiffin, J. L.
Temperature Tolerance of Pathogenic and Non-pathogenic Free-Living Amoebas,
W73-04330 5C

GRiffiths, J. S.
Effects of Acclimation and Acute Temperature Experience on the Swimming Speed of Juvenile Coho Salmon,
W73-04243 5C

GRIMME, H.
The Concentration of K, Ca, and Mg in the Saturation Extract in Relation to Exchangeable K, Ca, and Mg,
W73-03970 2K

GROB, L.
Mercury Pollution,
W73-04055 5B

GROSS, D. L.
Depositional Patterns, Facies, and Trace Element Accumulation in the Waukegan Member of the Late Pleistocene Lake Michigan Formation in Southern Lake Michigan,
W73-04361 2J

GRÖTERUD, O.
Ice Analyses. Data From Three Norwegian Lakes,
W73-04506 2C

GRUNAU, D. L.
Reverse Osmosis Water Purifier,
W73-04135 3A

GRUNES, D. L.
Effect of Nitrogen Source on Corn and Bromegrass Production, Soil pH, and Inorganic Soil Nitrogen,
W73-04173 3F

GUARINO, C. F.
Control of the Anaerobic Digestion Process and Supporting Unit Processes,
W73-04430 5D

AUTHOR INDEX

HILLEL, D.

GUINARD, N. W. The Remote Sensing of Oil Slicks, W73-03944	5B	HANKS, J. B. Salmonellae as an Index of Pollution of Surface Waters, W73-04426	5A	HATCHER, J. T. Calculation of Electrical Conductivity From Solution Composition Data as an Aid to In-Situ Estimation of Soil Salinity, W73-03984	2G
GUINN, V. P. Activation Analysis Trace-Element Studies fo Marine Biological Samples, W73-04327	5A	HANKS, R. J. Influence of Water Content on Electrical Con- ductivity of the Soil, W73-04093	2G	HAVEKOSTER, G. Ozone Active Carbon Treatment of Sea Water for Swimming Pools, (in German), W73-04411	3D
GULLAND, J. The Instability of Ocean Populations, W73-04240	5C	HANNA, S. R. Cooling Tower Plume Rise and Condensation, W73-04025	5D	HEERMANN, D. Center Pivot Irrigation, W73-03978	3F
GUNDLACH, D. L. Nonuniform Groundwater-Conduit Discharge and Head Loss, W73-04362	2F	HANNAN, H. H. Nitrogen and Phosphorus Dynamics in Three Central Texas Impoundments, W73-04484	5C	HEICHEL, G. H. Photosynthetic Response to Drought in Maize, W73-04260	3F
GUPTA, M. P. Non-Linear Thermodynamics of Soil-Water- Heat Systems, W73-03960	2G	HANSON, R. C. The Physicochemical Limnology of a Stretch of the Guadalupe River, Texas, With Five Main- Stream Impoundments, W73-04505	2H	HEITMAN, H. JR Sprinkler use for Swine Cooling, W73-04266	3E
GUPTA, M. P. Thermodynamics of Soil-Water System, W73-03961	2G	HANSON, R. C. Mercury Detection by Means of Thin Gold Films, W73-04123	5A	HELVEY, J. D. Predicting Soil Moisture in the Southern Ap- palachians, W73-04086	2G
GYSI, S. C. Influence of Water Content on Electrical Con- ductivity of the Soil, W73-04093	2G	HANUMANULU, V. Performance of Deep Trickling Filters by Five Methods, W73-04486	5D	HENRIKSEN, S. W. Energy Spectra of Sea Waves from Photo- graphic Interpretation, W73-03939	7B
GYSI, M. Flexible Pricing in Water Supply Planning--For Flexible Engineers, W73-04354	6A	HARDY, E. P. JR Fallout Program Quarterly Summary Report June 1, 1972 - September 1, 1972 - An Appen- dix, W73-04316	5B	HERMANN, E. R. Reduction of Atmospheric Toluene Diiso- cyanate by Water Vapor, W73-04184	5B
HAAN, C. T. Comparison of Multiple Regression and Prin- cipal Component Regression for Predicting Water Yields in Kentucky, W73-04199	4A	HARDY, E. P. JR Fallout Program Quarterly Summary Report, June 1, 1972 Through Sept. 1, 1972, W73-04315	5B	HERRMANN, F. A. JR Model Studies of Navigation Improvements, Columbia River Estuary: Report 2, Section 3, Fixed-Bed Studies of Disposal Areas C and D, W73-03915	8B
HADAS, A. Erosion Sediment Production, W73-04358	2J	HARR, M. E. Influence of Progressive Failure on Slope Sta- bility, W73-04366	8D	HEWLETT, J. D. Predicting Soil Moisture in the Southern Ap- palachians, W73-04086	2G
HADEN, R. S. Rainfall and Runoff in Urban Areas: Theory and Prediction, W73-04357	4C	HARRISON, S. C. The Sediments and Sedimentary Processes of the Holocene Tidal Flat Complex, Delmarva Peninsula, Virginia. W73-04360	2L	HIBBERD, H. New Sensors for the Automatic Sorting of Mu- nicipal Solid Waste, W73-04279	5D
HACKENBERRY, P. S. Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report, W73-04290	5B	HART, M. R. Minimizes Fruit Peel Pollution, W73-04284	5D	HIEFTJE, G. M. New, Directly Digital Automatic Titration Ap- paratus, W73-04252	7B
HADAS, A. Isothermal Drying of Structurally Layered Soil Columns, W73-04256	2D	HARTMAN, W. L. Limnology and Fish Ecology of Sockeye Sal- mon Nursery Lakes of the World, W73-04405	5C	HIGGINS, J. M. Regional Development of Public Water Supply Systems, W73-04064	3D
HADAS, A. Steady-State Evaporation Through Non- Homogeneous Soils From a Shallow Water Ta- ble, W73-04110	2D	HASHIMOTO, S. Studies on Purification Theories and Mechanism of Activated Sludge. (III) Similarity in Adsorption Mechanism of Activated Sludge and Charcoal, W73-03993	5D	HILER, E. A. Trickle Irrigation System Design, W73-04082	3F
HAERTEL, L. Ecological Factors Influencing Production of Algae in Northern Prairie Lakes, W73-03909	5C	HARTMAN, W. L. Studies on Purification Theories and Mechanism of Activated Sludge. (IV) Application of Purification Theories to the Activated Sludge Process, W73-03994	5D	HILL, D. M. Stream Faunal Recovery After Manganese Strip Mine Reclamation, W73-04546	5C
HALE, E. A. Fluid Pollution Eradicator System Including an Air Bubble Scrubbing Unit, W73-04137	5D	HASWELL, C. K. Pumped Storage and Tidal Power in Energy Systems, W73-04033	5G	HILL, V. R. Bathymetric Reconnaissance of Topaz Lake, Nevada and California, W73-04192	7C
HALE, E. A. Award Winning Water Treatment Plant Fea- tures Automation, W73-04447	5D	HILLEL, D. Isothermal Drying of Structurally Layered Soil Columns, W73-04256	2D	HILLEL, D.	
HALLADAY, W. B. Corporate Checkpoints to Pollution Control, W73-04483	5G				

AUTHOR INDEX

HILLEL, D.

- Measurement of Unsaturated Conductivity and Diffusivity by Infiltration Through an Impeding Layer, W73-03971 2G
- Steady-State Evaporation Through Non-Homogeneous Soils From a Shallow Water Table, W73-04110 2D
- Transient Infiltration into Crust-Topped Profiles, W73-03976 2G
- HILLS, L. D. The Clivus Toilet - Sanitation Without Pollution, W73-04482 5G
- Leading Question, W73-04017 5D
- HINDIN, E. Bioconcentration of Arsenic by Activated Sludge Biomass, W73-04124 5D
- HINDMAN, E. E. II Numerical Modeling of the Growth of Ice Crystals, Graupel, and Hail, W73-04104 2C
- HISAMATSU, Y. Reduction of Chromate by Zinc at Constant pH's. Chemistry of Chromate Treatment (Part 2) (In Japanese), W73-04282 5D
- HODGE, C. O. Waste Heat Use in Controlled-Environment Greenhouses, W73-04345 5G
- HODGES, C. N. Waste Heat Use in Controlled-Environment Greenhouses, W73-04345 5G
- HOEKSTRA, P. Radar Cross-Section Measurements of Snow and Ice, W73-03920 2C
- HOFFMAN, G. J. Sprinkling and Ponding Techniques for Reclaiming Saline Soils, W73-04081 3F
- HOLMES, J. W. Water Table Fluctuations Under Forest and Pasture in a Karstic Region of Southern Australia, W73-04374 2F
- HOLTY, J. G. Brucine Analysis for High Nitrate Concentrations, W73-04000 5A
- HORRIDGE, T. A. The Optimum Flocculant Concentration for Effective Flocculation of China Clay in Aqueous Suspension, W73-04477 5D
- HOWELL, T. A. Trickle Irrigation System Design, W73-04082 3F
- HRIVNAK, J. Relation Between Retention Indices and Boiling Points of Hydrocarbons Differing Slightly in Their Vapor Pressures, W73-04417 5A
- HUBER, J. F. K. Rapid Separation of Metal Chelates by Column Liquid-Liquid Chromatography using Ultraviolet Detection, W73-04391 5A
- HUDDART, R. Lampreys and Teleost Fish, Other than Whitebait, in the Polluted Thames Estuary, W73-04262 5C
- HUGHES, M. W. Comparison of Recharge to Groundwater Under Pasture and Forest Using Environmental Tritium, W73-04373 2F
- HUGHES, W. L. A Physicochemical Rationale for the Biological Activity of Mercury and Its Compounds, W73-04054 5C
- HUHTANEN, C. N. Efficiency of Salmonella Isolation from Meat- and Bone Meal of One 300-g Sample Versus Ten 30-g Samples, W73-04247 5A
- HULBERT, L. C. Effects of Soil Texture on Evaporative Loss and Available Water in Semi-Arid Climates, W73-03952 2D
- HUMBERT, R. D. Studies on Variants of *Bacillus Stearothermophilus* Strain NCA 1518, W73-04246 5A
- HUNN, J. D. A Hydrologic Description of Lake Magdalene Near Tampa, Florida, W73-04537 7C
- HUNT, B. W. Dispersion From Pit in Uniform Seepage, W73-04222 5B
- Seepage From Shallow Reservoir, W73-04221 4A
- HUNTINGTON, S. W. Pumped Storage and Tidal Power in Energy Systems, W73-04033 5G
- HURR, R. T. Ground-Water Levels in the South Platte River Valley of Colorado, 1968-72, W73-04211 7C
- HUTCHINSON, P. Calculation of Areal Rainfall Using Finite Element Techniques with Altitudinal Corrections, W73-04385 7C
- HYDE, W. H. Method and Apparatus for Controlling Substant Oil Seepage, W73-04128 5G
- IL'NITSKII, A. P. Navigation as One Source of Pollution of Water Basins by Carcinogenic Hydrocarbons (In Russian), W73-04186 5B
- IMESON, A. C. The Output of a Lowland Catchment, W73-04533 3B
- IMHOFF, C. Determination of Hydrocarbon Residues in Water, W73-04007 5A
- IMHOFF, K. H. Sludge Dewatering Tests with a Belt Press, W73-04432 5D
- INGRAM, G. E. Analytical Technique May Cut Oil Spills, W73-04429 5G
- INNES, R. B. Lake Ice Surveillance Via Airborne Radar: Some Experimental Results, W73-03937 7B
- IRISH, D. E. Computer-Aided Visual Spectrum Analysis, W73-04234 5A
- IRONS, D. A. JR Electromagnetic Pulse Sounding for Surveying Underground Water, W73-03912 7B
- IVANOV, I. P. Application of Lasers to Investigation of Glaci- Movement (Issledovaniye dinamiki dvizheniya lednikov s pomoshch'yu lazera), W73-04518 2C
- IVERSON, R. A. Effects of Elevated Temperature of Juvenile Coho Salmon and Benthic Invertebrates in Model Stream Communities, W73-04545 5C
- JACOBSEN, S. E. Optimal Pricing Policies for Conjunctive Urban Water Supply and Waste Water Treatment Systems, W73-04060 5G
- JACOBSON, R. L. The Chemical History of Some Spring Waters in Carbonate Rocks, W73-03959 5B
- JACOBY, H. D. Combined use of Optimization and Simulation Models in River Basin Planning, W73-04275 6A
- JANAK, J. Relation Between Retention Indices and Boiling Points of Hydrocarbons Differing Slightly in Their Vapor Pressures, W73-04417 5A
- JASKE, R. T. An Independent View of the Use of Thermal Power Station Cooling Water to Supplement Inter-Regional Water Supply, W73-04346 5G
- Potential Thermal Effects of an Expanding Power Industry: Columbia River Basin, W73-04204 5C
- JAYANGOUDAR, I. S. Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India, W73-04496 5D

AUTHOR INDEX

KITAJIMA, Y.

JEFFERS, F. J. A Method for Minimizing Effects of Waste Heat Discharges, W73-04481	5G	JORDAN, C. F. Radiological Physics Division Annual Report. Environmental Research, Jan.-Dec. 1971, W73-04303	5A	KELLER, E. A. A New Topological Relationship as an Indica- tor of Drainage Network Evolution, W73-04203	4A
JENSEN, M. H. Waste Heat Use in Controlled-Environment Greenhouses, W73-04345	5G	JORDAN, J. Perchlorate Determination by Thermometric Enthalpy Titration, W73-04230	5A	KENT, D. C. Sensitivity of Groundwater Flow Models to Vertical Variability of Aquifer Constants, W73-04065	2F
JENSEN, S. Sources of Error and Confirmation in the Determination of Methylmercury Radicals, W73-04050	5A	JUNG, P. D. Thin Layer Chromatographic Detection of Chlorinated Hydrocarbons as Cross-Contami- nants in Pesticide Formulations, W73-04396	5A	KEUP, L. E. Water Pollution. Freshwater Macroinver- tebrates, W73-04238	5C
JENTSCH, F. Ozone Active Carbon Treatment of Sea Water for Swimming Pools, (In German), W73-04411	5D	JUNGERMANN, E. Carbonate and Phosphate Detergent Builders: Their Impact on the Environment, W73-04440	5C	KHANTULEV, A. A. Nature of Soils and Patterns of Their Distribu- tion in the Kyra District, Chita Region, (In Rus- sian), W73-03977	2G
JESTER, W. A. Activation analysis of Heavy Metals in Surface Water Using Ion Exchange Filter Paper and Cyanide Complexing, W73-04329	5A	KAHN, B. Radiological Surveillance at Pressurized Water Reactors, W73-04325	5B	KHOLOYEVA, YE. V. Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschetny maksimal'nykh raskhodov vody dozhevyykh pavodkov na gornykh rekakh Kryma), W73-04115	2E
Sources of Water Pollution Established by Using a Neutron Activatable Tracer, W73-04326	5B	KAIRYUKSHTIS, L. A. Characteristics of the Seasonal Growth of Trees in the Light of Dendrochronological and Dendroclimatological Studies (In Russian), W73-04344	2I	KICHEN, J. H. Solutions for Miscible Displacement of Soil Water with Time-Dependent Velocity and Dispersion Coefficients, W73-04090	2G
JOHN, M. K. Factors Affecting Plant Uptake and Phytotoxic- ity of Cadmium Added to Soils, W73-04058	5B	KALBSKOPF, K-H. Studies on the Design Data of Gravity Thick- ening, W73-04433	5D	KIM, I-B Propagation of Grass Carp and Silver Carp, (In Korean), W73-04261	8I
JOHNSON, A. G. Activation Analysis of Mercury and Other En- vironmental Pollutants in Water and Aquatic Ecosystems, W73-04051	5A	KALBSKOPF, K-H. Studies on the Design Data of Gravity Thick- ening, W73-04433	5D	KING, J. W. Postharvest Cultural Practices Affecting the Rooting of Kentucky Bluegrass Sods Grown on Organic and Mineral Soils, W73-04175	3F
JOHNSON, D. B. Numerical Modeling of the Growth of Ice Crystals, Graupel, and Hail, W73-04104	2C	KAO, L. C. Kinetic Behavior of Mixed Populations of Ac- tivated Sludge, W73-04441	5D	KINSEY, W. F. III Overbank Sedimentation in the Delaware River Valley During the Last 6000 Years, W73-04194	2J
JOHNSON, D. L. Bacterial Reduction of Arsenate in Sea Water, W73-04479	5B	KASEVICH, R. S. Energy Spectra of Sea Waves from Photo- graphic Interpretation, W73-03939	7B	KINSMAN, G. Power Plant Cooling Systems, W73-04029	5D
JOHNSON, F. A. A Reconnaissance of the Winyah Bay Estuarine Zone, South Carolina, W73-04095	7C	KASIMOV, R. Y. Effect of Petroleum and Petroleum Products on Sturgeon and Other Fish, (In Russian), W73-04495	5C	KIRICHENKO, V. P. Effect of Irrigation, Fertilization and Plowing Depth on Quantity of White Wheat and Maize, W73-04267	3F
JOHNSON, J. D. Determination of Sea Ice Drift Using Side- Looking Airborne Radar, W73-03951	7B	KATZ, M. Effects on Freshwater Fish, W73-04236	5C	KIRKHAM, M. B. Stomatal Conductance of Differentially Salinized Plants, W73-04181	3C
JOHNSON, P. G. The Morphological Effects of Surges of the Donjek Glacier, St Elias Mountains, Yukon Territory, Canada, W73-03934	2C	KATZER, T. L. Bathymetric Reconnaissance of Marlette and Spooner Lakes, Washoe County and Carson City, Nevada, W73-04100	7C	KIRKWOOD, J. B. Bioenvironmental Safety Studies, Amchitka Island, Alaska. Cannikin D + 2 Months Report, W73-04317	5C
JOHNSON, W. F. Bioconcentration of Arsenic by Activated Sludge Biomass, W73-04124	5D	KAUFFMAN, M. E. Overbank Sedimentation in the Delaware River Valley During the Last 6000 Years, W73-04194	2I	KISSEL, D. E. Water Movement in Undisturbed Swelling Clay Soil, W73-04089	2G
JOLLY, J. P. Amplification Criterion of Gradually Varied, Single Peaked Waves, W73-04097	8B	KAZAKIA, Y. The Interaction of Large Amplitude Shallow- Water Waves With An Ambient Shear Flow: Non-Critical Flows, W73-04540	2E	KITAJIMA, Y. Reduction of Chromate by Zinc at Constant pH's. Chemistry of Chromate Treatment (Part 2) (In Japanese), W73-04282	5D
JONES, C. E. Andover Sewage-Treatment Works, W73-04439	5D	KEITH, F. W. JR Liquid and Sludge Treatment, W73-04143	5D		

AUTHOR INDEX

KLEMENT, A. W. JR

- KLEMENT, A. W. JR.**
Russian Radioecology. A Bibliography of Soviet Publications with Citations of English Translations and Abstracts,
W73-04298 5B
- KLEPPER, J. C.**
A Report on the Prototype Data Collected in the Potomac River for the Chesapeake Bay Model Study,
W73-04101 2L
- KLINE, J. R.**
Radiological Physics Division Annual Report. Environmental Research, Jan.-Dec. 1971,
W73-04303 5A
- KLUBKOV, V. G.**
Navigation as One Source of Pollution of Water Basins by Carcinogenic Hydrocarbons (In Russian),
W73-04186 5B
- KNETTIG, E.**
Flocculant Production from Kerosene,
W73-04245 5B
- KOCH, R. B.**
Inhibition of Oligomycin -Sensitive and -Insensitive Magnesium Adenosine Triphosphate Activity in Fish by Polychlorinated Biphenyls,
W73-04176 5C
- KOFFLER, R.**
Sea Surface Temperature Mapping off the Eastern United States Using NASA's Itos Satellite,
W73-03942 7B
- KOLACZKOWSKI, A. M.**
Activation analysis of Heavy Metals in Surface Waters Using Ion Exchange Filter Paper and Cyanide Complexing,
W73-04329 5A
- KOLDE, H.**
Radiological Surveillance at Pressurized Water Reactors,
W73-04325 5B
- KONONENKO, N. I.**
Effect of Underlying Formations on Annual Runoff in Lowlands of the Dniester River Basin (Vliyanie na godovoy stok osobennostey podstiyushchey poverkhnosty ravninnoy chasti basseyna Dnestra),
W73-04117 2E
- KONSTANTINOV, A. R.**
The Possibility of Estimating the Soil Moisture Reserve From Precipitation Data (In Russian),
W73-04019 2B
- KORBITZ, W.**
Experiences with the Sludge Program in the Denver Area,
W73-04286 5D
- KOSLOW, J. R.**
Chromatographic Detection of Water Contaminants,
W73-04423 5A
- KOTHANDARAMAN, V.**
Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India,
W73-04496 5D
- KOULOVATOS, J.**
Batch Sewage Treatment System,
W73-04136 5D
- KOVI, P. J.**
Electronic Spectra of 2-Aminoquinoline and 4-Aminoquinaldine. Evidence for the Cyclic Amidine Structure of the Singly Protonated Cations,
W73-04389 5A
- KOZIROWSKI, B.**
Radioactive Wastes,
W73-04312 5D
- KRAAK, J. C.**
Rapid Separation of Metal Chelates by Column Liquid-Liquid Chromatography using Ultraviolet Detection,
W73-04391 5A
- KRASYUK, S. B.**
The Possibility of Estimating the Soil Moisture Reserve From Precipitation Data (In Russian),
W73-04019 2B
- KREIDA, N. A.**
Dynamics of the Water and Chemical Properties of Typical and Podzolized Brown Forest Soils in the Maritime Territory (In Russian),
W73-03955 2G
- KRIEGER, H.**
Radiological Surveillance at Pressurized Water Reactors,
W73-04325 5B
- KRISHNA, J.**
Behavior of Koyna Dam-Dec. 11, 1967 Earthquake,
W73-04076 5E
- KRUPCIK, J.**
Relation Between Retention Indices and Boiling Points of Hydrocarbons Differing Slightly in Their Vapor Pressures,
W73-04417 5A
- KUCHARSKI, J.**
Radioactive Wastes,
W73-04312 5D
- KUDRNA, F.**
Putting Sewage Solids Back to Work,
W73-04159 5D
- KULINICH, V. I.**
Historic Flood on the Tisza River, May 12-18, 1970 (Vydayushchiya dozhddevoy pavodok na r. Tise 12-18 maya 1970 g.),
W73-04112 2E
- KUNIN, R.**
Ion Exchange for the Metal Products Finisher-Part I,
W73-04497 5D
- KUNITOMI, D. S.**
Elevation Changes Due to Tides, Long Beach, Calif.,
W73-04369 4B
- KUNZ, G. K.**
Method and Apparatus for Softening or Desalting Water by Ion Exchange,
W73-04133 3A
- KUNZE, G. W.**
The Effect of Electrolyte Composition on Hydraulic Conductivity of Certain Texas Soils,
W73-03986 2G
- KUROIWA, D.**
Grain-Boundary Energy and Grain-Boundary Groove Angles in Ice,
W73-03930 2C
- KUYKENDALL, J. K.**
Development of Economic Water Harvest Systems for Increasing Water Supply - Phase II,
W73-03901 3B
- KUZNETSOV, YU. V.**
Behavior of CS-137 and Ce-144 in the Sorption System Sea Water-Sediment,
W73-04324 5A
- LAFLEUR, P. D.**
Nuclear Activation Analysis of Se, As, Zn, Cd, and Hg in Environmental Matrices,
W73-04328 5A
- LAKIN, H. W.**
Selenium Accumulation in Soils and It's Absorption by Plants and Animals,
W73-04272 5C
- LAMBERTON, J. G.**
Large, Inexpensive Oven used to Decontaminate Glassware for Environmental Pesticide Analysis,
W73-04394 5A
- LANGMUIR, D.**
The Chemical History of Some Spring Waters in Carbonate Rocks,
W73-03959 5B
- LAPP, R. E.**
The Four Big Fears About Nuclear Power,
W73-04022 5C
- The Nuclear Plant Controversy - II: Power and Hot Water,
W73-04023 5C
- LAPSHINA, I. G.**
Lysimetric Method of Examining the Degree of Dehelminthization of Sewage (In Russian),
W73-04448 5D
- LARROWE, B. T.**
Lake Ice Surveillance Via Airborne Radar: Some Experimental Results,
W73-03937 7B
- LARSEN, P.**
Hydraulic Roughness of Ice Covers,
W73-04218 2C
- LARSON, W. E.**
Dynamics of the Soil-Water System During a Rainstorm,
W73-04107 2G
- LASETER, J. L.**
Adsorption and Concentration of Dissolved Carbon-14-DDT by Colloidal Particles in Surface Waters,
W73-04012 5B
- LAU, L. S.**
Wastewater Reclamation by Irrigation,
W73-04480 5D
- LAWSON, M. P.**
Nebraska Droughts: A Study of their Past Chronological and Spatial Extent with Implications for the Future,
W73-03907 2B
- LAZAR, M. E.**
Reduces Effluent from Blanching,
W73-04163 5D
- LE BRASSEUR, R.**
The Instability of Ocean Populations,
W73-04240 5C

AUTHOR INDEX

LUND, D. B.

- LE GOURIERES, D.**
Calculation of Discharge from Partially Penetrating Wells in Water Table Aquifers in Isotropic and Anisotropic Soils (Determination du debit des puits incomplets de nappes libres foncees en terrain isotrope et anisotrope),
W73-04382 4B
- LEE, J.**
Recent Sediments of the Central California Continental Shelf, Pigeon Point to Sand Hills Bluffs: Part B. Mineralogical Data,
W73-03922 2J
- LEE, K. K.**
Wind-Induced and Thermally Induced Currents in the Great Lakes,
W73-04208 2H
- LEE, W-S.**
Improved Procedure for Identification of Group D Enterococci with Two New Media,
W73-04253 5A
- LEESE, J.**
An Experimental Model for Automated Detection, Measurement and Quality Control of Sea-Surface Temperatures From ITOS-IR Data,
W73-03940 7C
- LEGOO, J. H.**
Modification of Schaefer's Procedure for Serotyping of Organisms of the Mycobacterium-M. Intracellulare-M. Scrofulaceum Complex,
W73-04398 5A
- LEGORE, R. S.**
Effects on Freshwater Fish,
W73-04236 5C
- LEIGHTY, E. G.**
Evaluation of Herbicides for Possible Mutagenic Properties,
W73-04233 5C
- LEITNER, G. F.**
Reverse Osmosis for Waste Water Treatment: What, When,
W73-04187 5D
- LENAERS, W. M.**
Photochemical Degradation of Sediment Organic Matter: Effect on ZN65 Release,
W73-04319 5B
- LERMAN, A.**
Strontium-90 in the Great Lakes: Concentration-Time Model,
W73-04296 5A
- LETTERMAN, R. D.**
Effect of Powdered Activated Carbon on Coagulation with Alum,
W73-04165 5D
- LEWIS, K. H.**
New Sensors for the Automatic Sorting of Municipal Solid Waste,
W73-04279 5D
- LI, RUH-MING**
Sheet Flow Under Simulated Rainfall,
W73-03921 2B
- LIANG, T.**
Optimal Design of Furrow Length of Surface Irrigation,
W73-03975 3F
- LICHTENSTEIN, E. P.**
Effects of Various Soil Fungi and Insecticides on the Capacity of *Mucor alternans* to Degrade DDT,
W73-04232 5B
- LIEBHARDT, W. C.**
Water Use Efficiency of Vegetable Crops Grown over Asphalt Moisture Barriers,
W73-03902 3F
- LINDEN, D. R.**
Soil Air Pressure and Water Infiltration Under Border Irrigation,
W73-04087 2G
- LINDSEY, S. E. J.**
The Role of the Specialist Water Treatment Company,
W73-04002 5F
- LINEBACK, J. A.**
Depositional Patterns, Facies, and Trace Element Accumulation in the Waukegan Member of the Late Pleistocene Lake Michigan Formation in Southern Lake Michigan,
W73-04361 2J
- LIN'KOVA, T. I.**
Paleomagnetic Studies of Bottom Sediments from the Indian Ocean Area of the Antarctic (Paleomagnitnyye issledovaniya donnykh otlozhennyi Indiyskogo sektora Antarktiki),
W73-04516 2J
- LISITSYN, A. P.**
Paleomagnetic Studies of Bottom Sediments from the Indian Ocean Area of the Antarctic (Paleomagnitnyye issledovaniya donnykh otlozhennyi Indiyskogo sektora Antarktiki),
W73-04516 2J
- LISKOWITZ, J. W.**
Measurement of Suspended Solids Concentrations in Sewage by use of a Depolarization Method,
W73-04185 5A
- LIVESEY, R. H.**
Statistical Properties of Missouri River Bed Forms,
W73-04365 8B
- LIVINGSTON, K.**
Nebraska Droughts: A Study of their Past Chronological and Spatial Extent with Implications for the Future,
W73-03907 2B
- LJUNGGRENN, K.**
Activation Analysis of Mercury and Other Environmental Pollutants in Water and Aquatic Ecosystems,
W73-04051 5A
- LOEFROTH, G.**
Methylmercury, A Review of Health Hazards and Side Effects Associated with the Emission of Mercury into Natural Systems,
W73-04127 5C
- LOFROTH, G.**
Birds Give Warning,
W73-04049 5C
- LOFTAS, T.**
The Oceans Have Become the Sinks of the World,
W73-03989 5C
- LONGBOTTOM, J. E.**
Inexpensive Mercury-Specific Gas Chromatographic Detector,
W73-04242 5A
- LONGHURST, A.**
The Instability of Ocean Populations,
W73-04240 5C
- LOPEZ, P. L.**
Isotopic Exchange Studies of Micronutrients in Soils,
W73-03963 2G
- LORCH, S.**
Determination of the Moisture Density and the Water Content Variation of a Soil by Measuring the Absorption of Gamma Rays, (In German),
W73-04072 2G
- LORENZEN, C.**
The Instability of Ocean Populations,
W73-04240 5C
- LOSEVA, E. I.**
New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin (Novyye dannyye o diatomovykh vodorodlyakh otlozhennyi boreal'moy transgressii v basseyne r. Vagi),
W73-04517 2J
- LOUCKS, D. P.**
Combined use of Optimization and Simulation Models in River Basin Planning,
W73-04275 6A
- LOVELL, C. W. JR**
Influence of Progressive Failure on Slope Stability,
W73-04366 8D
- LOVETT, M.**
Effluent Standards as Proposed by the Royal Commission on Sewage Disposal,
W73-04491 5G
- LOWE, E.**
Reconditions Brine to Cut Pollution,
W73-04160 5D
- LOWE, J. III**
Earth and Earth-Rock Dams,
W73-04074 8D
- LOWMAN, F. G.**
Stable Element Concentrations and Estimations of the Radionuclide Contents in the Fish and Invertebrates Sampled from the Waters Adjacent to Panama and Columbia,
W73-04307 5C
- LUBRANO, L.**
Determination of Water Stress of Eucalypts in the Field,
W73-04485 2I
- LUCAS, M.**
A Comparative Study of the Inactivation of Viruses in Water by Chlorine,
W73-03991 5F
- LUCKEY, R. R.**
Ground-Water Levels in the South Platte River Valley of Colorado, 1968-72,
W73-04211 7C
- LUND, D. B.**
Reduces Effluent from Blanching,
W73-04163 5D

AUTHOR INDEX

LYONS, C. G. JR.

LYONS, C. G. JR.	Trickle Irrigation...A More Efficient Means of Water Management, W73-03953	3C	MANN, J. A.	Hydrologic Aspects of Freshening Upper Old Tampa Bay, Florida, W73-04094	2H	MCCLAIN, W. C.	Radioactive Waste Repository Project; Annual Progress Report for Period Ending September 30, 1972, W73-04294	5B
LYONS, J. M.	A Temperature-induced Transition in Mitochondrial Oxidation: Contrasts Between Cold and Warm-Blooded Animals, W73-04027	5C	MARTIN, J. H.	Stable Element Concentrations and Estimations of the Radionuclide Contents in the Fish and Invertebrates Sampled from the Waters Adjacent to Panama and Columbia, W73-04307	5C	MCCORMICK, M. P.	Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102	5B
MAAGDENBERG, H. I.	Minimizes Fruit Peel Pollution, W73-04284	5D	MARTIN, Y. L.	Lichenometric Indication of the Time of Exposure of a Rock Substrate, (In Russian), W73-04334	7B	MCCOY, R.	The Urban Climate, W73-04355	4C
MACINTYRE, W. G.	Oil Slick Studies Using Photographic and Multispectral Scanner Data, W73-03945	5B	MASANORI, F.	Studies on Purification Theories and Mechanism of Activated Sludge. (III) Similarity in Adsorption Mechanism of Activated Sludge and Charcoal, W73-03993	5D	MCGUFFEY, K.	Dried Animal Waste as a Protein Supplement for Sheep, W73-04449	5E
MACKENTHUN, K. M.	Water Pollution. Freshwater Macroinvertebrates, W73-04238	5C	MATENKO, G. S.	Mountain Meadow Steppe Soils of the Chatkal Range (In Russian), W73-04164	2G	MCILVAINE, R. L.	Method and Apparatus for Removing Sludge from Liquid, W73-04142	5D
MACPHERSON, D. R.	Method of Water Filtration, W73-04132	5D	MATSUNAMI, T.	Observations of Radioruthenium and Radiocerium Isotopic Activity Ratios in Rain Water, W73-04313	5A	MCKEE, H. L.	Process and System for Control of Fluids in Water Disposal Surge Tanks, W73-04148	5D
MAGNO, P. J.	Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant, W73-04311	5A	MATSUSHITA, K.	Studies on Purification Theories and Mechanism of Activated Sludge. (IV) Application of Purification Theories to the Activated Sludge Process, W73-03994	5D	MCKERCHAR, A. I.	Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries, W73-04063	4A
MAITLAND, P. S.	Loch Lomond: Man's Effects on the Salmonid Community, W73-04407	5C	MATTIASSON, M.	Beneficial Use of Heat in Iceland, Technical and Economical Aspects and Future Prospects, W73-04348	5G	MCMANUS, D. A.	Analysis of Turbidite Correlation in Cascadia Basin, Northeast Pacific Ocean, W73-04249	5B
MALEC, E. J.	Quantitative Determination of Nitrilotriacetic Acid and Related Aminopolycarboxylic Acids in Inland Waters: Analysis by Gas Chromatography, W73-04183	5A	MATTOCK, G.	Effluent Standards From the Viewpoint of the Industrialist, W73-04493	5G	MCNEAL, B. L.	Calculation of Electrical Conductivity From Solution Composition Data as an Aid to In-Situ Estimation of Soil Salinity, W73-03984	2G
MAMAEV, E. V.	Use of Information on the Agrohydrological Properties of Soil in the Computation of Moisture Reserves in Farm Fields, (In Russian), W73-03917	3F	MAUGH, T. H.	Polychlorinated Biphenyls: Still Prevalent, But Less of A Problem, W73-04006	5C	MCNERNY, J. J.	Mercury Detection by Means of Thin Gold Films, W73-04123	5A
MAMURO, T.	Observations of Radioruthenium and Radiocerium Isotopic Activity Ratios in Rain Water, W73-04313	5A	MAYHEW, J. J.	Nitrogen and Phosphorus Dynamics in Three Central Texas Impoundments, W73-04484	5C	MCQUIVEY, R. S.	Hurst Phenomenon in Turbulence, W73-04206	2E
MANDAL, B. M.	Extraction of Anions into Chloroform by Surfactant Cations. Relevance to Dye Extraction Method of Analysis of Long Chain Amines, W73-04408	5A	MCCALLISTER, J. S. V.	Common Potato Scab: Effects of Irrigation, Manganese Sulphate and Sulphur Treatments for Common Potato Scab on Mineral Composition of Plant Material and Soil Extracts, W73-04168	5G	MECUCCI, M.	The Polluted Waters in Umbria: III. The River Nestore, (In Italian), W73-04393	5B
MANDARANO, B. M.	An Atomic Absorption Method for Cation Measurements in Kjeldahl Digests of Biological Materials, W73-04251	5A	MCCANN, J. A.	An Inventory of the Ponds, Lakes and Reservoirs of Massachusetts, Berkshire and Franklin Counties, W73-04069	2H	MEIER, M. F.	Microwave Emission From Snow-A Progress Report, W73-03950	7B
	New, Directly Digital Automatic Titration Apparatus, W73-04252	7B	MCCAULL, J.	Assault on a Lake, W73-04442	5C	MEISSNER, R.	Differences of Bacterial Groups of Nutrient Media in the Determination of Germ Groups in Water (In German), W73-04257	5A
MANI, V. V. S.	An Attempt at Estimating the Transmissibilities of Trappean Aquifers from Specific Capacity Values, W73-04527	2F	MELFI, S. H.	Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon, W73-04102	5B			

AUTHOR INDEX

NOBARI, E. S.

- MELHORN, W. N.**
A New Topological Relationship as an Indicator of Drainage Network Evolution,
W73-04203 4A
- MELKONYAN, G. I.**
Utilization of Deep Water Heat in Reservoirs for the Maintenance of Unfrozen Water Areas,
W73-04034 2C
- MEL'KUMYANTS, N. B.**
Phosphorescent Vibrios in Reservoirs of Turkmenia, (In Russian),
W73-04489 5C
- MENGEL, K.**
The Concentration of K, CA, and MG in the Saturation Extract in Relation to Exchangeable K, CA, and MG,
W73-03970 2K
- MENSHUTKIN, V. V.**
Mathematical Model of the Ecological System of Lake Drivatyat, (In Russian),
W73-04321 5C
- MERCADO, A.**
Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,
W73-04277 6D
- MERCER, W. A.**
Minimizes Fruit Peel Pollution,
W73-04284 5D
- MERMELSTEIN, N. H.**
Water Purification for Beverage Processing,
W73-04170 5F
- MERRILL, S. D.**
Field Measurement of Soil Water Potential With Thermocouple Psychrometers,
W73-04105 2G
- METCALF, W. G.**
Shallow-Water Strontium-90 Anomaly About the Antilles Arc-1970,
W73-04293 5B
- MIDLER, J. L.**
Optimal Pricing Policies for Conjunctive Urban Water Supply and Waste Water Treatment Systems,
W73-04060 5G
- MIHAIL, M.**
Researches on Removal of Colloidal Matter From Waste Water Produced in Sanitary Porcelain Ware and Ceramic Industry,
W73-03990 5D
- MIIDEL, A.**
Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii),
W73-04513 2C
- MILLER, C. R.**
Method and Apparatus for Water Softening,
W73-04145 3A
- MILLER, H. H. JR**
The Thermal-Water Horticultural Demonstration Project at Springfield, Oregon,
W73-04343 5G
- MILLHAM, C. B.**
A Dynamic Programming Study of Various Diversion Losses,
W73-04068 4A
- MILLSPAUGH, S. N.**
Evaluation of Treatment Plants by Tracer Methods, Annual Report, Jan. 1971-Jan. 1972,
W73-04297 5B
- MINTON, P.**
Unified Nondimensional Formulation for Open Channel Flow,
W73-04223 8B
- MIZOHATA, A.**
Observations of Radioruthenium and Radiocerium Isotopic Activity Ratios in Rain Water,
W73-04313 5A
- MOFFATT, D. L.**
Electromagnetic Pulse Sounding for Surveying Underground Water,
W73-03912 7B
- MOGL, H. M.**
Use of Surface Observations in Boundary Layer Analysis,
W73-04333 7C
- MOILL, E. J.**
Our Mangroves Threatened,
W73-04263 2I
- MOLOF, A. H.**
Wastewater Treatment Sequence,
W73-04146 5D
- MONCUR, J. E. T.**
Opportunity Costs of a Transbasin Diversion of Water I. Methodology,
W73-04276 4A
- MOORE, P. J.**
Lateral Pressures From Soft Clay,
W73-04367 8D
- MORAHAN, E. T.**
A Study of Water Institutions of Hawaii,
W73-04062 6B
- MOREL-SETOUX, H. J.**
Selection of Test Variable for Minimal Time Detection of Basin Response to Natural or Induced Changes,
W73-04061 4A
- MORGAN, J. C.**
Indexed Bibliography of Thermal Effects Literature - 1,
W73-04020 5C
- MORGAN, J. G.**
Indexed Bibliography of Thermal Effects Literature - 2,
W73-04353 5C
- MORRISON, S. R.**
Sprinkler use for Swine Cooling,
W73-04266 3E
- MORSE, T.**
Doing Time Takes on a New Meaning for the Wastemakers,
W73-04010 5G
- MULTER, R. H.**
Exact Nonlinear Model of Wave Generator,
W73-04220 2E
- MUNDAY, J. C. JR**
Oil Slick Studies Using Photographic and Multispectral Scanner Data,
W73-03945 5B
- MURLIN, A. M.**
Salmonellae as an Index of Pollution of Surface Waters,
W73-04426 5A
- MUROMTSEV, N. A.**
Soil Moisture Pressure and Relative Transpiration of Plants in the Case of Soil Drought (In Russian),
W73-04524 2D
- MYERS, J. H.**
Reverse Osmosis Can Cut Cost of Water Treatment,
W73-04549 5D
- MYHRE, D. V.**
Raman Spectra-Structure Correlation for Pyrazines. New Method for Obtaining Spectra of Trapped Nanoliter Gas Chromatograph Fractions,
W73-04388 5A
- NAGHSINEH-POUR, B.**
The Effect of Electrolyte Composition on Hydraulic Conductivity of Certain Texas Soils,
W73-03986 2G
- NAGHSKI, J.**
Efficiency of Salmonella Isolation from Meat-and-Bone Meal of One 300-g Sample Versus Ten 30-g Samples,
W73-04247 5A
- NAKAMURO, K.**
Studies of Nitrogen Compounds in Waters: I. Separate of Nitrate and Nitrite Nitrogen in Waste Waters (In Japanese),
W73-04188 5D
- NELSON, D. M.**
Radionuclides in Lake Michigan Fish,
W73-04306 5A
- NELSON, M. A.**
Sewage Treatment Plant and Method of Treating Sewage,
W73-04130 5D
- NEMETH, K.**
The Concentration of K, CA, and MG in the Saturation Extract in Relation to Exchangeable K, CA, and MG,
W73-03970 2K
- NICHOLSON, R. S.**
Influence of Amalgam Formation on Cyclic Voltammetry,
W73-04410 5A
- NICKS, A. D.**
Estimating Salinity of Streams in the Southwestern United States,
W73-04198 4A
- NIELSEN, D. R.**
Horizontal Infiltration into Layered Soils,
W73-04092 2G
- NIGHTINGALE, H. I.**
Rapid Measurement of Hydraulic Conductivity Changes in Slowly Permeable Soils,
W73-03968 2G
- NILSSON, N-A.**
Effects of Introductions of Salmonids into Barren Lakes,
W73-04406 5C
- NOBARI, E. S.**
Movements in Dams Due to Reservoir Filling,
W73-04073 8D

AUTHOR INDEX

NORDIN, C. F.

- NORDIN, C. F.
Hurst Phenomenon in Turbulence,
W73-04206 2E
- NORK, W. E.
Determination of a Coefficient of Dispersion
Under Field Conditions: Interim Report,
W73-04290 5B
- NUNN, E. B.
An Investigation into the Determination of Plu-
tonium in Soil by a Fusion Procedure,
W73-04295 5B
- NUTANT, J. A. JR.
Combination Urban-Power Systems Utilizing
Waste Heat,
W73-04350 5G
- OBAYASHI, A.
Control of Growth Rate by Initial Substrate
Concentration at Values Below Maximum
Rate,
W73-04499 5C
- OBERHOLTZER, J. D.
Oil Slick Studies Using Photographic and Mul-
tispectral Scanner Data,
W73-03945 5B
- O'BRIEN, D. M.
Method and Apparatus for Water Softening,
W73-04145 3A
- O'CONNOR, S. B.
The Expansion of Federal Common Law and
Federal Question Jurisdiction to Interstate Pol-
lution,
W73-04461 5G
- ODGAARD, J.
Relative Diffusion in Nonisotropic Turbulence,
W73-04212 5B
- OERTEL, R. P.
Raman Spectra-Structure Correlation for
Pyrazines. New Method for Obtaining Spectra
of Trapped Nanoliter Gas Chromatograph
Fractions,
W73-04388 5A
- OGDEN, P. R.
Development of Economic Water Harvest
Systems for Increasing Water Supply - Phase
II,
W73-03901 3B
- OJEA, F. GUITIAN
Evapotranspiration and Potential Evapotran-
spiration Measures in Santiago de Compostela
(Spain),
W73-04028 2D
- OKUN, D. A.
Regional Development of Public Water Supply
Systems,
W73-04064 3D
- OLSSON, L. E.
Mixing-Height Measurement by Lidar, Particle
Counter, and Rawinsonde in the Willamette
Valley, Oregon,
W73-04102 5B
- OLSSON, M.
Activation Analysis of Mercury and Other En-
vironmental Pollutants in Water and Aquatic
Ecosystems,
W73-04051 5A
- ONUFRIYENKO, L. G.
Spring-Flood Runoff From Small Watercourses
in the Ukraine and Moldavia (Ob'yemy stoka
vesennego polovod'ya malykh vodotokov
Ukrainy i Moldavii),
W73-04116 2E
- ORBAN, J.
Oil Spillage Control Process,
W73-04129 5G
- ORTHLIEB, F.
Multi-Sensor Oil Spill Detection,
W73-03946 5B
- ORTOLANO, L.
A Procedure and Case Study Demonstrations
for Evaluating the Cost of Thermal Effluent
Control for Proposed Steam-Electric Generat-
ing Units,
W73-04070 5G
- A Procedure for Estimating Costs of Thermal
Effluent Modifications for Existing Steam-
Electric Generating Stations,
W73-04071 5G
- ORVINI, E.
Nuclear Activation Analysis of Se, As, Zn, Cd,
and Hg in Environmental Matrices,
W73-04328 5A
- OSE, Y.
Studies of Nitrogen Compounds in Waters: I.
Separate of Nitrate and Nitrite Nitrogen in
Waste Waters (In Japanese),
W73-04188 5D
- OSTER, J. D.
Calculation of Electrical Conductivity From
Solution Composition Data as an Aid to In-Situ
Estimation of Soil Salinity,
W73-03984 2G
- Sprinkling and Ponding Techniques for
Reclaiming Saline Soils,
W73-04081 3F
- OTTERLIND, G.
Activation Analysis of Mercury and Other En-
vironmental Pollutants in Water and Aquatic
Ecosystems,
W73-04051 5A
- OVERTON, D. E.
Shape Effects on Resistance in Flood-Plain
Channels,
W73-04213 8B
- PABAT, L. A.
Water Permeability of Frozen Soil in Connec-
tion with Anterosion Conservation Tillage of
Fall-Plowed Soil on Slopes, (In Ukrainian),
W73-03916 2G
- PABST, A. F.
Flood Forecasting in the Upper Midwest - Data
Assembly and Preliminary Analysis,
W73-03906 4A
- PADUN, N. N.
Hydrologic Studies in Northern Algeria (O
gidrologicheskoy i zuchenosti territorii Sever-
nogo Alzira),
W73-04120 2E
- PAGAN, F. A.
Notes on A Mangrove Lagoon and Mangrove
Channels at La Parguera, Puerto Rico,
W73-04241 5C
- PAL, R.
Non-Linear Thermodynamics of Soil-Water-
Heat Systems,
W73-03960 2G
- Thermodynamics of Soil-Water System,
W73-03961 2G
- PARDUE, H. L.
Miniature On-Line Digital Computer for Multi-
purpose Applications. Applications to Kinetic
Analyses,
W73-04387 7C
- PARIZEK, R. R.
Sources of Water Pollution Established by
Using a Neutron Activatable Tracer,
W73-04326 5B
- PARK, G. G.
Before and After Studies on the Effects of a
Power Plant Installation on Lake LBJ - a Nu-
merical Temperature Model for Lake LBJ,
W73-04335 5B
- PARKER, R. A.
Miniature On-Line Digital Computer for Multi-
purpose Applications. Applications to Kinetic
Analyses,
W73-04387 7C
- PARKER, R. O. JR.
An Electronic Detector System for Recovering
Internally Tagged Menhaden, Genus Brevoortia,
W73-04174 7B
- PARKHURST, J. D.
Waste Water Reuse-A Supplemental Supply,
W73-03987 5D
- PARLANGE, J.-Y.
Theory of Water Movement in Soils: 4. Two
and Three Dimensional Steady Infiltration,
W73-04106 2G
- Theory of Water Movement in Soils: 5. Un-
steady Infiltration From Spherical Cavities,
W73-04225 2G
- PECK, B. B.
Cooling Water Chlorination and Productivity of
Entrained Phytoplankton,
W73-04427 5F
- PEGRAM, R. G.
Some Observations on the Reduction of 2,3,5,-
Triphenyltetrazolium Chloride by Escherichia
Coli,
W73-04250 5B
- PENNEY, M. E.
Oil Slick Studies Using Photographic and Mul-
tispectral Scanner Data,
W73-03945 5B
- PERRENS, S. J.
The Numerical Analysis of Infiltration Into
Heterogeneous Porous Media,
W73-04091 2G
- PERRY, D. E.
An Analysis of Transmission Line Audible
Noise Levels Based Upon Field and Three-
Phase Test Line Measurements,
W73-04085 8C
- PETERS, L. JR.
Electromagnetic Pulse Sounding for Surveying
Underground Water,
W73-03912 7B

AUTHOR INDEX

RAUP, M.

PETERSON, G. E. Trace-Metal Analysis Using Atomic Absorption Spectrophotometry, W73-04043	5A	POPOCHENKO, V. I. Consumption of Oligochaete Worms by Fish and Invertebrates, (In Russian), W73-04520	2I	PULLEN, E. J. Hydrographic Survey of the Galveston Bay System, Texas 1963-66, W73-04190	2L
PHILIP, J. R. Hydrostatics in Swelling Soils and Soil Suspensions: Unification of Concepts, W73-03982	8D	POPE, W. H. Dehydrated Poultry Waste in Poultry Rations, W73-03992	5E	PUSKAR, R. J. Electromagnetic Pulse Sounding for Surveying Underground Water, W73-03912	7B
PHILLIPS, R. Nebraska Droughts: A Study of their Past Chronological and Spatial Extent with Implications for the Future, W73-03907	2B	POPOVA, N. S. A Study of Erosion Resistance of Soils on the Northern Slopes of Trans-Ili Alatau and the Ketmen Range (In Russian), W73-04179	2J	PUTNAN, A. L. Rainfall and Runoff in Urban Areas—A Case Study of Flooding in the Piedmont of North Carolina, W73-04356	4C
PHILLIPS, R. E. A Rapid Method of Measurement of Diffusion Coefficients in Aqueous Solutions, W73-03966	2K	PORCELLO, L. J. Lake Ice Surveillance Via Airborne Radar: Some Experimental Results, W73-03937	7B	QUAKENBUSH, F. W. Analysis for Crude Fatty Acids (Total Fatty Acids and Unsaponifiable Matter) in Feed Grade Fats: Report of the Joint AOAC-AOCS Committee on the Analysis of Feed Grade Fats, W73-04397	5A
PICHEL, W. An Experimental Model for Automated Detection, Measurement and Quality Control of Sea-Surface Temperatures From ITOS-IR Data, W73-03940	7C	POST, A. Periodic Surge Origin of Folded Medial Moraines on Bering Piedmont Glacier, Alaska, W73-03935	2C	QUINN, F. H. Transient Analysis of the Detroit River by the Implicit Method, W73-04207	2E
PICKERING, C. W. Catfish Farming - Beneficial Use of Waste Heat, W73-04341	5G	POTWOROWSKI, H. S. Brucine Analysis for High Nitrate Concentrations, W73-04000	5A	RAHNI, E. Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii), W73-04513	2C
PIKE, E. B. An Evaluation of Procedures for Enumerating Bacteria in Activated Sludge, W73-04450	5A	POULOVASSILIS, A. The Changeability of the Hydraulic Conductivity of Saturated Soil Samples, W73-04108	2G	RAISON, J. K. A Temperature-Induced Transition in Mitochondrial Oxidation: Contrasts Between Cold and Warm-Blooded Animals, W73-04027	5C
PINCHAK, A. C. Electronic Detection of Serac Avalanches and Glacier Noise at Vaughan Lewis Icefall, Alaska, W73-03929	2C	POWER, J. F. Effect of Nitrogen Source on Corn and Bromegrass Production, Soil pH, and Inorganic Soil Nitrogen, W73-04173	3F	RALLS, J. W. Minimizes Fruit Peel Pollution, W73-04284	5D
PIONKE, H. B. Estimating Salinity of Streams in the Southwestern United States, W73-04198	4A	PRANGE, W. Geological and Archaeological Investigation of the Mode of Origin of the Marshes in Nordfriesland (Germany), (In German), W73-04229	2L	RALSTON, P. H. Inhibiting Water Formed Deposits with Threshold Compositions, W73-04166	5D
PITTWELL, L. R. Some Coordination Effects in Natural Waters of Ethiopia, W73-04529	2K	PRATT, C. J. Bagnold Approach and Bed-Form Development, W73-04217	8B	RAND, G. H. Elements of Selection for Secondary Waste Treatment Systems, W73-04287	5D
PLATO, P. Use of Fallout Cesium-137 as a Tracer to Define the Recent Deltaic Facies of a River, W73-04501	2J	PRATT, M. W. Concentration Factors of Chemical Elements in Edible Aquatic Organisms, W73-04125	5C	RANN, C. S. Automatic Sorting of Infrared Spectra, W73-04413	7C
PLOEG, J. Wave Climate Study: Great Lakes and Gulf of St. Lawrence—Volume II, Appendices A, B, and C, W73-04103	2H	PRATT, P. F. Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils, W73-03983	2K	RANSFORD, G. D. Uplift Computations for Hollow Gravity Dams, W73-04083	8A
POIRIER, M. A. Adsorption and Concentration of Dissolved Carbon-14-DDT by Coloring Colloids in Surface Waters, W73-04012	5B	Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils, W73-03974	5B	RAO, P. K. Sea Surface Temperature Mapping off the Eastern United States Using NASA's Itos Satellite, W73-03942	7B
POLCYN, F. C. A Method for Calculating Water Depth, Attenuation Coefficients and Bottom Reflectance Characteristics, W73-03941	7B	PREISS, K. Relation Between Energy and Error Due to Nuclear Statistics for Density Measurement by Gamma Ray Transmission, W73-03964	8D	RAUKAS, A. Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii), W73-04513	2C
POLK, P. E. Award Winning Water Treatment Plant Features Automation, W73-04447	5D	PREFEJCHAL, W. Radionuclides in Lake Michigan Fish, W73-04306	5A	RAUP, M. Vegetation of the Mesters Vig District, Northeast Greenland: General Summary and Discussion, W73-04264	2I

AUTHOR INDEX

RAUSSER, G. C.

RAUSSER, G. C.			
Learning, External Benefits, and Subsidies in Water Desalination, W73-04274	6B		
RAWLINGS, F. F.			
Determination of Selected Trace Elements in Natural Water Samples Using Spark Source Mass Spectroscopy, W73-04304	5A		
RAWLINS, S. L.			
Field Measurement of Soil Water Potential With Thermocouple Psychrometers, W73-04105	2G		
REAVEY, T. C.			
Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant, W73-04311	5A		
REBER, E. E.			
On the Correlation of the Total Precipitable Water in a Vertical Column and Absolute Humidity at the Surface, W73-03923	2B		
RED'KIN, N. E.			
Structural Composition and Nutrient Status of Calcareous Chernozem in Crop Rotation, (In Russian), W73-04224	3F		
REICHARDT, K.			
Horizontal Infiltration into Layered Soils, W73-04092	2G		
REICHENBAUGH, R. C.			
A Hydrologic Description of Lake Magdalene Near Tampa, Florida, W73-04537	7C		
REICHMAN, G. A.			
Effect of Nitrogen Source on Corn and Bromegrass Production, Soil pH, and Inorganic Soil Nitrogen, W73-04173	3F		
REISH, D. J.			
Marine and Estuarine Pollution, W73-04237	5A		
REISS, A.			
Nebraska Droughts: A Study of their Past Chronological and Spatial Extent with Implications for the Future, W73-03907	2B		
REISS, J.			
Toxic Effects of the Mycotoxins Aflatoxin B1, Rubratoxin B, Patulin, and Diacetoxyscirpenol on the Crustacean Cyclops fuscus, W73-04395	5C		
RENDLEMAN, R. A.			
Lake Ice Surveillance Via Airborne Radar: Some Experimental Results, W73-03937	7B		
RENFRO, W. C.			
Losses of 65 ZN To Inorganic Surfaces in a Marine Algal Nutrient Medium, W73-04011	5C		
RETZLAFF, G.			
Investigations on the Water Uptake of Cracking and Noncracking Cotyledons of Bean Seeds (<i>Phaseolus vulgaris</i> L.) (In German), W73-04301	3F		
REZNIKOV, M.			
Modification of Schaefer's Procedure for Serotyping of Organisms of the <i>Mycobacterium-M. Intracellulare-M. Scrofulaceum</i> Complex, W73-04398	5A		
RICCA, V. T.			
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part I - Technical Aspects, W73-04542	2A		
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part II - The Computer Program, W73-04543	2A		
The Ohio State University Version of the Stanford Streamflow Simulation Model: Part III - User's Manual, W73-04544	2A		
RICE, B. L.			
Bathymetric Reconnaissance of Rye Patch Reservoir and the Pitt-Taylor Reservoirs, Pershing County, Nevada, W73-04227	7C		
RICE, R. M.			
Using Canonical Correlation for Hydrological Predictions, W73-04381	2E		
RICHARDS, F. P.			
A Study of the Marine Resources of Dorchester Bay, W73-04189	6C		
RICHARDSON, I. D.			
Development of Systems in Marine Fish Cultivation in the United Kingdom, W73-04339	5G		
RICKARD, W.			
Performance of a Frost-Tube for Determination of Soil Freezing and Thawing Depths, W73-04254	7B		
RILEY, S. J.			
A Comparison of Morphometric Measures of Bankfull, W73-04375	2E		
RITCHIE, J. T.			
Water Movement in Undisturbed Swelling Clay Soil, W73-04089	2G		
RITTER, D. F.			
Overbank Sedimentation in the Delaware River Valley During the Last 6000 Years, W73-04194	2I		
RIVERS, E. D.			
Available Water Capacity of Sandy and Gravelly North Dakota Soils, W73-04109	2G		
ROBBINS, J. A.			
Environmental Chemistry: Grand River Studies, W73-04305	5B		
ROBERTSON, G. C.			
Inline Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment, W73-04161	5D		
ROBERTSON, J. H.			
Handling and Disposal of Chemical Wastes, W73-04008	5D		
ROBINSON, P. E.			
Water Treatment Plant for Today and Tomorrow, W73-04435	5D		
RODEN, R. B.			
Computer-Aided Visual Spectrum Analysis, W73-04234	5A		
ROGERS, J. E.			
Water Resources of Ouachita Parish, Louisiana, W73-04504	4B		
ROHWER, F. S.			
The 1971 Tritium Symposium at Las Vegas, W73-04318	5A		
ROICHENKO, G. I.			
Mountain Meadow Steppe Soils of the Chatkal Range (In Russian), W73-04164	2G		
ROMANENKO, N. A.			
Lysimetric Method of Examining the Degree of Dechlorination of Sewage (In Russian), W73-04448	5D		
ROMANI, F.			
Influence of Progressive Failure on Slope Stability, W73-04366	8D		
ROMBERG, G. P.			
Radionuclides in Lake Michigan Fish, W73-04306	5A		
ROMNEY, E. M.			
Radioecology and Ecophysiology of Desert Plants at the Nevada Test Site, W73-04300	5C		
ROMO, F.			
Forms of Nitrogen in the Volcanic Soils of Sibundoy (In Spanish), W73-04032	5B		
ROSS, D. A.			
Red Sea Drillings, W73-04193	2J		
ROSS, S.			
Soil-Water Relationship, W73-03981	3F		
ROTHLIBERGER, H.			
Water Pressure in Intra- and Subglacial Channels, W73-03927	2C		
ROUTSON, R. C.			
Techniques for the Characterization of suspended Sediment and Selected Applications for the Acquired Data, W73-04302	5B		
RUHLIN, R. R.			
Preventive Maintenance and Operational Know-How Improve Waste Treatment Systems, W73-04278	5D		
RUSH, F. E.			
Bathymetric Reconnaissance of Marlette and Spooner Lakes, Washoe County and Carson City, Nevada, W73-04100	7C		
Bathymetric Reconnaissance of Rye Patch Reservoir and the Pitt-Taylor Reservoirs, Pershing County, Nevada, W73-04227	7C		

AUTHOR INDEX

SHAIK, S. G.

BATHYMETRIC RECONNAISSANCE OF TOPAZ LAKE, NEVADA AND CALIFORNIA, W73-04192	7C	SAYRE, W. W. Longitudinal Dispersion in Sinuous Channels, W73-04214	5B	SCHOOF, R. R. Estimating Salinity of Streams in the Southwestern United States, W73-04198	4A
RUSTAMOVA, S. A. Effect of Petroleum and Petroleum Products on Sturgeon and Other Fish, (In Russian), W73-04495	5C	STATISTICAL PROPERTIES OF MISSOURI RIVER BED FORMS, W73-04365	8B	SCHULMAN, S. G. Electronic Spectra of 2-Aminoquinoline and 4-Aminoquinadine. Evidence for the Cyclic Amidine Structure of the Singly Protonated Cations, W73-04389	5A
RUTHERFORD, G. K. The Clay Mineralogy and Some Properties of Bottom Sediments of the St. Lawrence River Near Kingston, Ontario, W73-04538	2J	SCAMBARY, R. Australian Sirotherm Process Removes Salt from Brackish Water, W73-04285	5F	SCHULTZ, J. M. The Structure of Liquid Water, W73-03903	2K
RYDER, R. A. The Limnology and Fishes of Oligotrophic Glacial Lakes in North America (About 1800 A.D.), W73-04401	5C	SCARBOROUGH, E. N. Water Use Efficiency of Vegetable Crops Grown over Asphalt Moisture Barriers, W73-03902	3F	SCHULTZ, V. Russian Radioecology. A Bibliography of Soviet Publications with Citations of English Translations and Abstracts, W73-04298	5B
SAINI, S. S. Behavior of Koyna Dam--Dec. 11, 1967 Earthquake, W73-04076	8E	SCARPINO, P. V. A Comparative Study of the Inactivation of Viruses in Water by Chlorine, W73-03991	5F	SCHUMACKER, R. Concerning Conservation of the Hohe Mark Forest Massif and of the High Valleys of the Schwalm and Its Tributaries at Elsenborn, W73-04523	6G
SALAS-LA CRUZ, J. D. Stochastic Structure of Water Use Time Series, W73-04098	4A	SCHARPF, C. A. Siting A Thermal Multi-Purpose Energy Center, W73-04021	5C	SCHUMANN, H. H. Hydrologic Regimen of Lower Tonto Creek Basin, Gila County, Arizona--A Reconnaissance Study, W73-04099	3B
SALOMAN, C. H. Hydrographic Observations in Tampa Bay, Florida--1969, W73-03926	5A	SCHEBETKOVSKII, V. N. Behavior of Cs-137 and Ce-144 in the Sorption System Sea Water-Sediment, W73-04324	5A	SCHWABAUER, D. E. Inline Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment, W73-04161	5D
SAMEOTO, D. D. Yearly Respiration Rate and Estimated Energy Budget for Sagitta elegans, W73-04400	5B	SCHELL, W. R. Studies of the Natural Alpha-Emitting Radioisotopes in Marine Organisms, W73-04320	5B	SCHWEINFURTH, S. P. Energy Resources of the United States, W73-04039	6G
SAMMEL, E. A. Ground Water Reconnaissance in the Arghandab River Basin Near Kandahar, Afghanistan, W73-04379	4B	SCHERER, C. H. Reclamation and Industrial Reuse of Amarillo's Waste Water, W73-03988	5D	SCOTT, B. R. Bathymetric Reconnaissance of Marlette and Spooner Lakes, Washoe County and Carson City, Nevada, W73-04100	7C
SANDLER, S. L. The Structure of Liquid Water, W73-03903	2K	SCHERZ, J. P. Remote Sensing Considerations for Water Quality Monitoring, W73-03947	5B	SECHLER, F. R. Sewage Treatment System, W73-04141	5D
SANTINI, R. E. Some Comments on the Signal-to-Noise Characteristics of Real Photomultiplier and Photodiode Detection Systems, W73-04419	7B	SCHIERMEIER, F. A. Large Power Plant Effluent Study (Lappes) Volume 3 - Instrumentation, Procedures, and Data Tabulations (1970), W73-04121	5A	SEIER, L. Dehydrated Poultry Waste in Poultry Rations, W73-03992	5E
SANUI, H. An Atomic Absorption Method for Cation Measurements in Kjeldahl Digests of Biological Materials, W73-04251	5A	SCHIMMIDT, P. Method for the Direct Measurement of Absolute Water Consumption of Woody Plants (In German), W73-04177	2I	SELENKA, F. Differences of Bacterial Groups of Nutrient Media in the Determination of Germ Groups in Water (In German), W73-04257	5A
SASAKI, K. Studies of Nitrogen Compounds in Waters: I. Separate of Nitrate and Nitrite Nitrogen in Waste Waters (In Japanese), W73-04188	5D	SCHIMMIDT, P. S. Before and After Studies on the Effects of a Power Plant Installation on Lake LBJ - a Numerical Temperature Model for Lake LBJ, W73-04335	5B	SENTURIA, S. D. New Sensors for the Automatic Sorting of Municipal Solid Waste, W73-04279	5D
SASMAN, R. T. Thermal Pollution of Ground Water by Artificial Recharge, W73-04038	5B	SCHMOTZER, J. K. Sources of Water Pollution Established by Using a Neutron Activatable Tracer, W73-04326	5B	SEREBROV, L. I. The Significance of the Rivers of the Volga Delta in the Spawning of Fish (In Russian), W73-04522	2I
SAUER, V. B. Unit-Response Method of Open-Channel Flow Routing, W73-04215	8B	SCHMUTZLER, D. L. Method and Apparatus for Clarifying Liquids, W73-04152	5D	SHABAD, L. M. Navigation as One Source of Pollution of Water Basins by Carcinogenic Hydrocarbons (In Russian), W73-04186	5B
SAYATO, Y. Studies of Nitrogen Compounds in Waters: I. Separate of Nitrate and Nitrite Nitrogen in Waste Waters (In Japanese), W73-04188	5D	SCHMUTZLER, J. H. Method and Apparatus for Clarifying Liquids, W73-04152	5D	SHAIK, S. G. Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India, W73-04496	5D

AUTHOR INDEX

SHAMPINE, W. J.

- SHAMPINE, W. J.**
Water Resources of Union Parish, Louisiana,
W73-04503 4B
- SHANFIELD, H.**
Reverse Osmosis Water Purifier,
W73-04135 3A
- SHARON, D.**
Spatial Analysis of Rainfall Data from Dense Networks,
W73-04383 7C
- The Spottiness of Rainfall in a Desert Area,
W73-04532 2B
- SHAW, T. L.**
Pumped Storage and Tidal Power in Energy Systems,
W73-04033 5G
- Tidal Energy From the Bay of Fundy,
W73-04041 8A
- SHAYKEWICH, C. F.**
Water Absorption by Wheat Seeds as Influenced by Hydraulic Properties of Soil,
W73-04172 3F
- SHCHERBINA, M. A.**
Accessibility of Amino Acids in Artificial Food To Pond Fish: III. Accessibility of Amino Acids in Soybean Meal, Castor Oil Cakes, Wheat and Food Mixes to Yearling Carp (In Russian),
W73-04309 8I
- SHCHERBININ, A. D.**
Relationship Between Circulation and Structure of Waters of the Indian Ocean (O vzaimosvyazi tsirkulyatsii i struktury vod Indiyskogo okeana),
W73-04515 2E
- SHERMAN, F. B. JR**
Electrical Earth Resistivity Surveying in Landfill Investigations,
W73-03918 5B
- SHERIFF, J. D. F.**
Some Single- and Multi-Site Models of Rainfall Within Discrete Time Increments,
W73-04372 2B
- SHIPP, R. F.**
Available Water Capacity of Sandy and Gravelly North Dakota Soils,
W73-04109 2G
- SHREVE, R. L.**
Movement of Water in Glaciers,
W73-03936 2C
- SILBERMAN, H. C.**
Carbonate and Phosphate Detergent Builders: Their Impact on the Environment,
W73-04440 5C
- SIMMONS, H. B.**
Effects of Proposed Runway Extensions at Laguardia Airport on Tides, Currents, Shoaling, and Dye Dispersion,
W73-04096 8B
- SINDHWANI, S. K.**
Titrimetric Microdetermination of Zinc With EDTA Using 1,5-Di-Beta-Naphthylthiocarbazone (HNDZ) as an Extractive Indicator,
W73-04231 5A

- SINGH, R.**
Absorption of Water by a Soil from a Circular Cylindrical Source,
W73-04200 5B
- SINGH, R. B.**
The BIO-Gas Plant: Generating Methane from Organic Wastes,
W73-04157 5G
- SINGH, R. P.**
Titrimetric Microdetermination of Zinc With EDTA Using 1,5-Di-Beta-Naphthylthiocarbazone (HNDZ) as an Extractive Indicator,
W73-04231 5A
- SIROTENKO, O. D.**
The Possibility of Objective Control of Soil Moisture Data (In Russian),
W73-04180 2G
- SJOSTRAND, B.**
Activation Analysis of Mercury and Other Environmental Pollutants in Water and Aquatic Ecosystems,
W73-04051 5A
- SKOPINTSEV, B. A.**
Evaluation of Size of Organic Substance Losses During Steaming of Natural Waters (In Russian),
W73-04521 5G
- SMART, J. S.**
Quantitative Characterization of Channel Network Structure,
W73-04204 8B
- SMIRNOVA, S. I.**
Use of Information on the Agrohydrological Properties of Soil in the Computation of Moisture Reserves in Farm Fields, (In Russian),
W73-03917 3F
- SMITH, C.**
Sewer Service Gamble Worth \$120,000,
W73-04434 5G
- SMITH, E. B.**
High Sensitivity Thermochemical Analysis,
W73-04420 7B
- SMITH, F. A.**
A Procedure and Case Study Demonstrations for Evaluating the Cost of Thermal Effluent Control for Proposed Steam-Electric Generating Units,
W73-04070 5G
- A Procedure for Estimating Costs of Thermal Effluent Modifications for Existing Steam-Electric Generating Stations,
W73-04071 5G
- SMITH, F. W.**
Finite-Element Stress Analysis of Avalanche Snowpacks,
W73-03928 2C
- SMITH, H. A. JR**
N Sub 2-Threat to Pacific Northwest Fisheries,
W73-04075 8I
- SMITH, M. F.**
Oil Collection Boom,
W73-04134 5G
- SMITH, R. E.**
The Infiltration Envelope: Results From a Theoretical Infiltrometer,
W73-04376 2G
- SMITH, R. I. L.**
Growth Form and Water Relations of Mosses in the Maritime Antarctic,
W73-04259 2C
- SMITH, S. H.**
Factors of Ecologic Succession in Oligotrophic Fish Communities of the Laurentian Great Lakes,
W73-04399 5C
- SMITH, T. R.**
Stability and the Conservation of Mass in Drainage Basin Evolution,
W73-04202 2A
- SNIDER, J. L.**
Water Resources of Union Parish, Louisiana,
W73-04503 4B
- SNYDER, G. R.**
Thermal Effects Studies on the Lower Columbia River, 1968-70,
W73-04331 5C
- SOBEY, R. J.**
Unified Nondimensional Formulation for Open Channel Flow,
W73-04223 8B
- SOJAK, L.**
Relation Between Retention Indices and Boiling Points of Hydrocarbons Differing Slightly in Their Vapor Pressures,
W73-04417 5A
- SOMERSCALES, E. F. C.**
A Technique for the Comparison of Contact and Non-Contact Measurements of Water Surface Temperature,
W73-03948 7B
- SOMMERFELD, R. A.**
Finite-Element Stress Analysis of Avalanche Snowpacks,
W73-03928 2C
- SONUGA, J. O.**
Principle of Maximum Entropy in Hydrologic Frequency Analysis,
W73-04531 7C
- SOONG, R.**
Dehydrated Poultry Waste in Poultry Rations,
W73-03992 5E
- SPANOGLE, D.**
Radar Cross-Section Measurements of Snow and Ice,
W73-03920 2C
- SPENCER, G. K.**
Lateral Pressures From Soft Clay,
W73-04367 8D
- SPINUL, M. P.**
Water Permeability of Frozen Soil in Connection with Anterosion Conservation Tillage of Fall-Plowed Soil on Slopes, (In Ukrainian),
W73-03916 2G
- SPRAGG, H. R.**
Treatment of Sewage,
W73-04139 5D

AUTHOR INDEX

THOMASON, B. S.

- SQUIRE, J. L. JR.**
Measurements of Sea Surface Temperature on the Eastern Pacific Continental Shelf Using Airborne Infrared Radiometry, August 1963 - July 1968,
W73-04352 7B
- SREE RAMULU, U. S.**
Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils,
W73-03983 2K
- Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils,
W73-03974 5B
- STALEY, J. T.**
Incidence of Prosthecate Bacteria in a Polluted Stream,
W73-04265 5B
- STANTON, C. R.**
Water Shortage in the Forest Floor of Subalpine Forests of Alberta,
W73-04169 4A
- STATHAM, M.**
Microbes as Tracers of Water Movement,
W73-04392 5B
- STEFAN, H.**
Impact of Cooling Water on Lake Temperatures,
W73-04037 5B
- STEIN, R. G.**
A Matter of Design,
W73-04030 6C
- STEINKE, T. D.**
Our Mangroves Threatened,
W73-04263 2I
- STEPANOVA, L. A.**
Production of Mass Forms of Planktonic Crustaceans in Lake Ilmen (In Russian),
W73-04548 2H
- STEVENSON, D. S.**
Flow of Water into Ceramic Tubes Simulating Root Systems,
W73-04271 2I
- STEWART, M. L.**
Radiological Physics Division Annual Report. Environmental Research, Jan.-Dec. 1971,
W73-04303 5A
- STEWART, S. R.**
A Method for Calculating Water Depth, Attenuation Coefficients and Bottom Reflectance Characteristics,
W73-03941 7B
- STIFF, M. J.**
3-Propyl-5-Hydroxy-5-D-Arabinotetrahydroxybutyl-3-Thiazolidine-2-Thione. A Specific Colorimetric Reagent for the Determination of Copper in Water,
W73-04056 5A
- STOCKHO, W. L.**
The Dose to Man from Atmospheric KR-85,
W73-04291 5B
- STRAUB, C. P.**
Radioactive Wastes,
W73-04239 5B
- STRONG, A. E.**
Sea Surface Temperature Mapping off the Eastern United States Using NASA's Itos Satellite,
W73-03942 7B
- STUCKEY, R. L.**
Changes of Vascular Aquatic Flowering Plants During 70 Years in Put-In-Bay Harbor, Lake Erie, Ohio,
W73-04258 5C
- STUCKY, H. R.**
National Water Research Opportunities,
W73-03911 6B
- SUDNITSYN, I. L.**
Soil Moisture Pressure and Relative Transpiration of Plants in the Case of Soil Drought (In Russian),
W73-04524 2D
- SUTCLIFFE, J. V.**
An Index of Flood-Producing Rainfall Based on Rainfall and Soil Moisture Deficit,
W73-04528 2A
- SUZUKI, S.**
Grain-Boundary Energy and Grain-Boundary Groove Angles in Ice,
W73-03930 2C
- SWANSON, R. J.**
Atmospheric Water Collector,
W73-04149 3B
- SWEET, B. H.**
Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters,
W73-04390 5F
- SWIDLER, J. C.**
Problems and Opportunities in Waste Heat Disposal,
W73-04347 5G
- SWIFT, D. J. P.**
Characterization of the Sediments from the Tuira and Sabana River Estuaries,
W73-04308 5C
- Stable Element Concentrations and Estimations of the Radionuclide Contents in the Fish and Invertebrates Sampled from the Waters Adjacent to Panama and Columbia,
W73-04307 5C
- SWOBODA, A. B.**
Anion Exclusion Effects on Chloride Movement in Soils,
W73-03973 2K
- SWOPE, J. R.**
On the Correlation of the Total Precipitable Water in a Vertical Column and Absolute Humidity at the Surface,
W73-03923 2B
- SZYFTER, B.**
Floatable Breakwater Element,
W73-04153 8A
- TAKAHASHI, M. T.**
Evaluation of Herbicides for Possible Mutagenic Properties,
W73-04233 5C
- TANG, C. H.**
Energy Spectra of Sea Waves from Photographic Interpretation,
W73-03939 7B
- TANJI, K. K.**
A Computer Analysis on the Leaching of Boron From Stratified Soil Columns,
W73-03967 2G
- TATUM, J. W.**
The Physicochemical Limnology of a Stretch of the Guadalupe River, Texas, With Five Main-Stream Impoundments,
W73-04505 2H
- TAYLOR, J. L.**
Hydrographic Observations in Tampa Bay, Florida--1969,
W73-03926 5A
- TELEK, G.**
Characterization of the Sediments from the Tuira and Sabana River Estuaries,
W73-04308 5C
- TERENT'EV, A. A.**
Contribution to Methods of Applied Investigations of Soil Erosion on the Right Bank of the Volga in the Gorki Region, (In Russian),
W73-04053 2J
- TESTAVERDE, S. A.**
A Study of the Marine Resources of Dorchester Bay,
W73-04189 6C
- THACKSTON, E. L.**
Predicting Effects of Dead Zones on Stream Mixing,
W73-04288 5B
- THAMES, J. L.**
Solutions for Miscible Displacement of Soil Water with Time-Dependent Velocity and Dispersion Coefficients,
W73-04090 2G
- THEOBALD, P. K.**
Energy Resources of the United States,
W73-04039 6G
- ATHERGAONKAR, V. P.**
Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India,
W73-04496 5D
- THOMAS, G. W.**
Anion Exclusion Effects on Chloride Movement in Soils,
W73-03973 2K
- THOMAS, J. W.**
Dried Animal Waste as a Protein Supplement for Sheep,
W73-04449 5B
- THOMAS, K. L.**
Batch Sewage Treatment System,
W73-04136 5D
- THOMAS, M. P.**
Gazetteer of Natural Drainage Areas of Streams and Water Bodies within the State of Connecticut,
W73-03914 7C
- THOMASON, B. M.**
Salmonellae as an Index of Pollution of Surface Waters,
W73-04426 5A

AUTHOR INDEX

THOMSEN, B. W.

THOMSEN, B. W.
Hydrologic Regimes of Lower Tonto Creek Basin, Gila County, Arizona-A Reconnaissance Study,
W73-04099 3B

THOMSON, K. P. B.
Thermal Scanner Observations over Lake Ontario,
W73-03949 7B

THORPE, G. R.
Pumped Storage and Tidal Power in Energy Systems,
W73-04033 5G

TIDEMAN, P. I.
A Survey of Attitudes Towards the Mississippi River as a Total Resource in Minnesota,
W73-03905 6B

TIKHONOV, V. N.
A High-Selective Titration Method for Determining Copper with 2,2-Bicinchoninic Acid (In Russian),
W73-04248 5A

TING, R. Y.
Stable Element Concentrations and Estimations of the Radionuclide Contents in the Fish and Invertebrates Sampled from the Waters Adjacent to Panama and Columbia,
W73-04307 5C

TINKER, J.
Europe's Majestic Sewer,
W73-04428 5G

TINNIMIT, P.
Dried Animal Waste as a Protein Supplement for Sheep,
W73-04449 5E

TKACHEV, A. A.
Effect of the Soil Moisture Content on the Mobility of Iron and Manganese (In Russian),
W73-04255 2G

TOBIAS, R. C.
In-line Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment,
W73-04161 5D

TODOROVIC, P.
On the Time When the Extreme Flood Occurs,
W73-04210 2E

TOMLINSON, R. D.
Losses of 65 ZN To Inorganic Surfaces in a Marine Algal Nutrient Medium,
W73-04011 5C

TONKONOZHENKO, E. V.
Effect of the Soil Moisture Content on the Mobility of Iron and Manganese (In Russian),
W73-04255 2G

TONOMURA, M.
Studies of Nitrogen Compounds in Waters: I. Separate of Nitrate and Nitrite Nitrogen in Waste Waters (In Japanese),
W73-04188 5D

TOPOL, G. J.
Internal Precipitation of Phosphate from Activated Sludge,
W73-04131 5D

TOUHILL, C. J.

An Independent View of the Use of Thermal Power Station Cooling Water to Supplement Inter-Regional Water Supply,
W73-04346 5G

TOVBIN, M. V.

Investigation of the Possibility of Artificial Control of the Rate of Evaporation from Soils (In Russian),
W73-04013 2D

TRENT, W. L.

Hydrographic Survey of the Galveston Bay System, Texas 1963-66,
W73-04190 2L

TREPOV, G. V.

Laser Applications in the Investigation of Ice-Sheet Dynamics (O vozmozhnosti ispol'zovaniya lazernoy dilya issledovaniya dinamiki lednikovykh pohrovov),
W73-04510 2C

TREXLER, D. T.

Multi-Sensor Oil Spill Detection,
W73-03946 5B

TSUKANO, Y.

Pesticide Regulations and Residue Problems in Japan,
W73-04042 5B

TSUPKO, N. V.

Effect of Karst on Floods on Left-Bank Tributaries of the Dniester River (Vlyyanie karsta na formirovaniye livnevyykh pavodkov na levoberezhnykh pritokakh Dnestr'a),
W73-04114 2E

TUFT, W. L.

Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon,
W73-04102 5B

TUSL, J.

Fluoroide Ion Activity Electrode as a Suitable Means for Exact Direct Determination of Urinary Fluoride,
W73-04415 5A

UDODOVA, A. F.

The Possibility of Objective Control of Soil Moisture Data (In Russian),
W73-04180 2G

UHLER, K. A.

Sources of Water Pollution Established by Using a Neutron Activatable Tracer,
W73-04326 5B

UMNOV, A. A.

Mathematical Model of the Ecological System of Lake Drivyat', (In Russian),
W73-04321 5C

VAN DEN HEUVEL, J.

Tidal Energy From the Bay of Fundy,
W73-04041 8A

VAN DER BEKEN, A.

The Lateral Inflow into Submerged Drains,
W73-04384 8B

VAN EVERDINGEN, R. O.

Thermal and Mineral Springs in the Southern Rocky Mountains of Canada,
W73-04363 4B

VAN KOLMESCHATE, G. J.

Mercury in the Environment - Techniques of Analysis (XIII. Analysetechniken voor Kwik in Het Milieu),
W73-04046 5A

VAN LAERSHOVEN, C. J.

Factors Affecting Plant Uptake and Phytotoxicity of Cadmium Added to Soils,
W73-04038 5B

VARLEY, E.

The Interaction of Large Amplitude Shallow-Water Waves With an Ambient Shear Flow: Non-Critical Flows,
W73-04540 2E

VASIL'EVA, A. K.

Dynamics of the Water and Chemical Properties of Typical and Podzolized Brown Forest Soils in the Maritime Territory (In Russian),
W73-03955 2G

VEDENINA, A. A.

Nature of Soils and Patterns of Their Distribution in the Kyra District, Chita Region, (In Russian),
W73-03977 2G

VELAUTHAN, T.

A Shellfish-Borne Cholera Outbreak in Malaysia,
W73-04182 5C

VIESSMAN, W. JR

National Water Research Opportunities,
W73-03911 6B

VIGULYARNAYA, L. S.

Investigation of the Possibility of Artificial Control of the Rate of Evaporation from Soils (In Russian),
W73-04013 2D

VIJAYAKUMAR, A.

Mercury Concentration in Recent and Ninety-Year-Old Benthopelagic Fish,
W73-04122 5B

VINOGRADOV, A. P.

Concentration of C-14 in the Troposphere During 1953 to 1971, (In Russian),
W73-04323 5A

VISHNEVSKYI, P. F.

Historic Flood on the Tisza River, May 12-18, 1970 (Vydavushchiysya dozhdoyev pavodok na r. Tise 12-18 maya 1970 g.),
W73-04112 2E

VLASOVA, N. I.

Lysimetric Method of Examining the Degree of Dehelminthization of Sewage (In Russian),
W73-04448 5D

VOL'FTSUN, M. L.

Particle Size of Mudflows on Carpathian Rivers in the Ukraine (Granulometricheskiy sostav selevykh otlozhenny na rekakh Ukrainskikh Karpat),
W73-04119 2E

VOLKOVA, V. P.

Chemical Composition of Atmospheric Precipitation in the Deputatskiy Region (Khimicheskiy sostav atmosfernykh osadkov v vypadayushchikh na territorii Deputatskogo rayona),
W73-04511 2B

ORGANIZATIONAL INDEX

AUTHOR INDEX

YANG, W. T.

- VOLOSHIN, I. L.
Minimum Streamflow in Northwest Ukraine
(Osobennosti formirovaniya minimal'nogo
stoka rek Severo-Zapada Ukrayiny),
W73-04118 2E
- WAHANIK, R. J.
Circulating Water Systems Without Valves,
W73-04035 SD
- WAHLGREN, M. A.
Determination of Selected Trace Elements in
Natural Water Samples Using Spark Source
Mass Spectroscopy,
W73-04304 5A
- Environmental Chemistry: Grand River Studies,
W73-04305 5B
- WALDRON, L. J.
Soil Hydraulic Conductivity and Bulk Volume
Changes During Cyclic Calcium-Sodium
Exchange,
W73-03965 2K
- WALLACE, A.
Radioecology and Ecophysiology of Desert
Plants at the Nevada Test Site,
W73-04300 5C
- WALLEY, W. J.
Calculation of Areal Rainfall Using Finite Ele-
ment Techniques with Altitudinal Corrections,
W73-04385 7C
- WARD, C. J.
Our Mangroves Threatened,
W73-04263 2I
- WARD, J.
Water Absorption by Wheat Seeds as In-
fluenced by Hydraulic Properties of Soil,
W73-04172 3F
- WARD, R. C.
The Output of a Lowland Catchment,
W73-04533 3B
- WARNS, J. C.
The Ohio State University Version of the Stan-
ford Streamflow Simulation Model: Part III-
User's Manual,
W73-04544 2A
- WARREN, C. B.
Quantitative Determination of Nitrilotriacetic
Acid and Related Aminopolycarboxylic Acids
in Inland Waters: Analysis by Gas Chromatog-
raphy,
W73-04183 5A
- WARRICK, A. W.
Solutions for Miscible Displacement of Soil
Water with Time-Dependent Velocity and
Dispersion Coefficients,
W73-04090 2G
- WASHBURN, C. A.
Clean Water and Power,
W73-04436 5G
- WATSON, K. K.
The Numerical Analysis of Infiltration Into
Heterogeneous Porous Media,
W73-04091 2G
- WEERHEIM, A. J.
Computer-Aided Visual Spectrum Analysis,
W73-04234 5A
- WEITKAMP, D.
Effects on Freshwater Fish,
W73-04236 SC
- WELCH, R. M.
Vanadium Determination in Biological Materi-
als at Nanogram Levels by a Catalytic Method,
W73-04409 5A
- WEST, D. W.
Determination of a Water Table in a Soil
Profile Using the Platinum Oxygen Cathode,
W73-03985 2G
- WESTWOOD, I. J.
Pumped Storage and Tidal Power in Energy
Systems,
W73-04033 5G
- WHEATLAND, A. B.
Separation of Activated Sludge from Mixed
Liquor Using a Continuous Centrifuge,
W73-04431 5D
- WHISLER, F. D.
The Numerical Analysis of Infiltration Into
Heterogeneous Porous Media,
W73-04091 2G
- WHITELEY, H. R.
A Sampling Scheme for Shallow Snowpacks,
W73-04386 7B
- WHITEMAN, C. D. JR
Ground Water in the Plaquemine-White Castle
Area, Iberville Parish, Louisiana,
W73-04502 4B
- WHITMARSH, R. B.
Red Sea Drillings,
W73-04193 2J
- WILDE, P.
Recent Sediments of the Central California
Continental Shelf, Pigeon Point to Sand Hills
Bluffs: Part B. Mineralogical Data,
W73-03922 2J
- WILDUNG, R. E.
Techniques for the Characterization of
suspended Sediment and Selected Applications
for the Acquired Data,
W73-04302 5B
- WILLARDSON, L. S.
Sprinkling and Ponding Techniques for
Reclaiming Saline Soils,
W73-04081 3F
- WILLIAMS, G. D. V.
Geographical Variations in Yield-Weather
Relationships Over A Large Wheat Growing
Region,
W73-04171 3F
- WILLIS, C.
Learning, External Benefits, and Subsidies in
Water Desalination,
W73-04274 6B
- WILLIS, J. F.
Direct Filtration an Economic Answer to Water
Treatment Needs,
W73-04446 5D
- WILLIS, M. J.
Planning Concrete Dam Construction Control
Surveys,
W73-04077 8A
- WILSON, D. G.
New Sensors for the Automatic Sorting of Mu-
nicipal Solid Waste,
W73-04279 5D
- WILSON, L.
Seasonal Sediment Yield Patterns of U.S.
Rivers,
W73-04205 2J
- WIMPENNY, J. W. T.
Microbes as Tracers of Water Movement,
W73-04392 5B
- WING, H.
Impact of Cooling Water on Lake Tempera-
tures,
W73-04037 5B
- WINKLER, F.
New Sensors for the Automatic Sorting of Mu-
nicipal Solid Waste,
W73-04279 5D
- WOOD, C. D.
Optimizing an Activated Carbon Wastewater
Treatment Plant,
W73-04421 5D
- WOOD, R.
Higher Standards: The Local Authorities View,
W73-04492 5F
- WOODSON, R. D.
Logical Approaches to Power Supply and En-
vironment,
W73-04036 5G
- WOOLHISER, D. A.
On the Time When the Extreme Flood Occurs,
W73-04210 2E
- WORTHINGTON, P. F.
Methods for the Calculation of True Formation
Factors in the Bunter Sandstone of Northwest
England,
W73-04534 2F
- WU, I-PAI
Optimal Design of Furrow Length of Surface
Irrigation,
W73-03975 3F
- WYLIE, E. B.
Transient Analysis of the Detroit River by the
Implicit Method,
W73-04207 2E
- WYSOCKI, G.
Recovers Salable Products from Waste Yeast,
W73-04014 5D
- YAKIMENKO, V. N.
Nutritional and Water Requirements of
Buckwheat,
W73-04268 3F
- YAMAUCHI, H.
A Study of Water Institutions of Hawaii,
W73-04062 6B
- YANCEY, T.
Recent Sediments of the Central California
Continental Shelf, Pigeon Point to Sand Hills
Bluffs: Part B. Mineralogical Data,
W73-03922 2J
- YANG, W. T.
Mariculture in Japan Using Heated Effluent
Water,
W73-04340 5G

AUTHOR INDEX

YAP, H. H.

YAP, H. H.
Inhibition of Oligomycin-Sensitive and -Insensitive Magnesium Adenosine Triphosphate Activity in Fish by Polychlorinated Biphenyls, W73-04176 5C

VEN, C.-L.
Shape Effects on Resistance in Flood-Plain Channels, W73-04213 8B

YEVJEVICH, V.
Amplification Criterion of Gradually Varied, Single Peaked Waves, W73-04097 8B

Stochastic Structure of Water Use Time Series, W73-04098 4A

YOUNG, A. W.
Radiocarbon in the Sea, W73-04292 5B

YOUNG, D. R.
Activation Analysis Trace-Element Studies to Marine Biological Samples, W73-04327 5A

YOUNG, R. A.
Water Supply for the Nuclear Rocket Development Station at the U.S. Atomic Energy Commission's Nevada Test Site, W73-04370 4B

YOUNG, R. H.
Wastewater Reclamation by Irrigation, W73-04480 5D

YOUNG, W. C.
Nitrogen and Phosphorus Dynamics in Three Central Texas Impoundments, W73-04484 5C

The Physicochemical Limnology of a Stretch of the Guadalupe River, Texas, With Five Main-Stream Impoundments, W73-04505 2H

VU, Y.
Dried Animal Waste as a Protein Supplement for Sheep, W73-04449 5E

YUODVAL'KIS, A. L.
Characteristics of the Seasonal Growth of Trees in the Light of Dendrochronological and Dendroclimatological Studies (In Russian), W73-04344 21

ZABIK, M. J.
The Uptake of Insecticides by Freshwater Mussels and the Effects of Sublethal Concentrations of Insecticides on These Mussels, W73-03904 5C

ZAJIC, J. E.
Flocculant Production from Kerosene, W73-04245 5B

ZEGERS, C.
Mercury in Fish - Imported Tinned Fish, (IX. Kwikgehalten van een Aantal Sorten Ingeblikte Vis), W73-04045 5C

ZHUKOV, V. A.
The Possibility of Objective Control of Soil Moisture Data (In Russian), W73-04180 2G

ZIEMBA, J. V.
Reduces BOD 99%...At Low Cost, W73-04001 5D

ZUCKERMAN, M. M.
Wastewater Treatment Sequence, W73-04146 5D

ZUIDEMA, F. C.
The Lateral Inflow into Submerged Drains, W73-04384 8B

YAN KUO-LIN, CHIA-LI, YU,
An Evaluation of Water Quality Indicators in Relation to Industrial Discharge. Research on Industrial Discharge in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
Water Quality Index During the Rainy Season, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

YAN LIN-CHANG, C. L.
An Evaluation of Industrial Discharge in Relation to Water Quality and Chemical Properties of Thermal and Industrial Wastes, 81140-ETW
Study on Water Pollution in Taiwan, 81140-ETW

ORGANIZATIONAL INDEX

ABERDEEN UNIV. (SCOTLAND). DEPT. OF BOTANY.	AGRICULTURAL RESEARCH SERVICE, MANDAN, N. DAK. NORTHERN GREAT PLAINS RESEARCH CENTER.	AKADEMIYA NAUK LITOVSKOI SSR, VILNIUS. OTDEL GEOGRAFI.
Growth Form and Water Relations of Mosses in the Maritime Antarctic, W73-04259	Effect of Nitrogen Source on Corn and Bromegrass Production, Soil pH, and Inorganic Soil Nitrogen, W73-04173	Summaries of Reports Presented at the Twelfth Scientific Conference on Shoreline Studies Held in Lithuania in September 1971 (XII nauchnaya konferentsiya po izucheniyu morev'ya. Tezisy dokladov), W73-04514
ABERDEEN UNIV. (SCOTLAND). DEPT. OF GEOGRAPHY.	AGRICULTURAL RESEARCH SERVICE, PHOENIX, ARIZ. WATER CONSERVATION LAB.	AKADEMIYA NAUK SSSR, LENINGRAD. INSTITUT EVOVYUTSIONNOI FIZIOLOGII BIOKHIMII.
The Pleistocene Moraine Stages of West-Central Peru, W73-03931	The Numerical Analysis of Infiltration Into Heterogeneous Porous Media, W73-04091	Mathematical Model of the Ecological System of Lake Drivyaty, (In Russian), W73-04321
ADCON CORP., SANTA BARBARA, CALIF.	AGRICULTURAL RESEARCH SERVICE, PROSSER, WASH. IRRIGATED	AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT BIOLOGII VNUTRENNYKH VOD.
Analytical Technique May Cut Oil Spills, W73-04429	AGRICULTURE RESEARCH AND EXTENSION CENTER.	Hydrobionts' Adaptation to a Toxic Factor, (In Russian), W73-04500
AEROSPACE CORP., EL SEGUNDO, CALIF.	Agriculturally-Polluted Irrigation Water as a Source of Plant-Parasitic Nematode Infestation, W73-03954	Evaluation of Size of Organic Substance Losses During Steaming of Natural Waters (In Russian), W73-04521
On the Correlation of the Total Precipitable Water in a Vertical Column and Absolute Humidity at the Surface, W73-03923	AGRICULTURAL RESEARCH SERVICE, RENO, NEV.	AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT GEOKHIMMI I ANALITICHESKOI KHMIMI.
2B	Soil Air Pressure and Water Infiltration Under Border Irrigation, W73-04087	Concentration of C-14 in the Troposphere During 1953 to 1971, (In Russian), W73-04323
AGRICULTURAL COLL., COIMBATORE (INDIA).	AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF.	AKADEMIYA NAUK SSSR, MOSCOW. INSTITUT OKEANOLOGI.
Dissolution of Dicalcium Phosphate in Relation to Iron Oxide Content of Acid Soils, W73-03983	Sprinkling and Ponding Techniques for Reclaiming Saline Soils, W73-04081	Relationship Between Circulation and Structure of Waters of the Indian Ocean (O vzaimosvazi tsirkulyatsii i strukturny vod Indiyskogo okeana), W73-04515
2K	AGRICULTURAL RESEARCH SERVICE, RIVERSIDE, CALIF. SALINITY LAB.	AKADEMIYA NAUK SSSR, SYKTYVKAR. INSTITUT GEOFIZIKI.
AGRICULTURAL RESEARCH COUNCIL, CAMBRIDGE (ENGLAND). UNIT OF SOIL PHYSICS.	Calculation of Electrical Conductivity From Solution Composition Data as an Aid to In-Situ Estimation of Soil Salinity, W73-03984	New Data on Diatoms from Sediments of the Boreal Transgression in the Vaga River Basin (Novyye dannyye o diatomovyykh vodorolyakh otlozhennii boreal'noy transgressii v basseyne r. Vagi), W73-04517
The Effect of the Entrapped Air on the Hysteresis Curves of A Porous Body and on its Hydraulic Conductivity, W73-03969	Field Measurement of Soil Water Potential With Thermocouple Psychrometers, W73-04105	AKADEMIYA NAUK SSSR, BILLINGSFORS BRUK (SWEDEN).
2G	AGRICULTURAL RESEARCH SERVICE, ST PAUL, MINN. SOIL AND WATER CONSERVATION RESEARCH DIV.	Ion Exchange Resin for Removal of Heavy Metal Ions in Waste Water, W73-04047
The Changeability of the Hydraulic Conductivity of Saturated Soil Samples, W73-04108	Dynamics of the Soil-Water System During a Rainstorm, W73-04107	ALEXANDRIA UNIV. (EGYPT).
2G	AGRICULTURAL RESEARCH SERVICE, ST PAUL, MINN. SOIL AND WATER CONSERVATION RESEARCH DIV.	Air Permeability as Related to Particle Size and Bulk Density in Sand System, W73-03972
AGRICULTURAL RESEARCH SERVICE, ALBANY, CALIF. WESTERN UTILIZATION RESEARCH AND DEVELOPMENT DIV.	AGRICULTURAL RESEARCH SERVICE, ST PAUL, MINN. SOIL AND WATER CONSERVATION RESEARCH DIV.	AMERICAN GEOGRAPHICAL SOCIETY, NEW YORK. DEPT. OF EXPLORATION AND FIELD RESEARCH.
Minimizes Fruit Peel Pollution, W73-04284	The Infiltration Envelope: Results From a Theoretical Infiltrometer, W73-04376	Survey of the Rusty Glacier Area, Yukon Territory, Canada, 1967-70, W73-03932
5D	AHWAZ AGRICULTURAL COLL., (IRAN).	AMSTERDAM UNIV. (NETHERLANDS).
AGRICULTURAL RESEARCH SERVICE, BELTSVILLE, MD. HYDROGRAPH LAB.	The Effect of Electrolyte Composition on Hydraulic Conductivity of Certain Texas Soils, W73-03986	The Output of a Lowland Catchment, W73-04533
Shape Effects on Resistance in Flood-Plain Channels, W73-04213	AKADEMIYA NAUK ESTONSKOI SSR, TALLIN.	AMSTERDAM UNIV. (NETHERLANDS). LAB. FOR ANALYTICAL CHEMISTRY.
8B	Marginal Glaciation in Northern Estonia (Krayevyye lednikovyye obrazovaniya Severnoy Estonii), W73-04513	Rapid Separation of Metal Chelates by Column Liquid-Liquid Chromatography using Ultraviolet Detection, W73-04391
AGRICULTURAL RESEARCH SERVICE, CHICKASHA, OKLA. SOUTHERN GREAT PLAINS WATERSHED RESEARCH CENTER.	AKADEMIYA NAUK ESTONSKOI SSSR, TALLIN. TALLINN BOTANICAL GARDEN.	5A
Estimating Salinity of Streams in the Southwestern United States, W73-04198	Lichenometric Indication of the Time of Exposure of a Rock Substrate, (In Russian), W73-04334	
4A	7B	
AGRICULTURAL RESEARCH SERVICE, COLLEGE STATION, TEX.		
Water Movement in Undisturbed Swelling Clay Soil, W73-04089		
2G		
AGRICULTURAL RESEARCH SERVICE, FRESCO, CALIF.		
Rapid Measurement of Hydraulic Conductivity Changes in Slowly Permeable Soils, W73-03968		
2G		
AGRICULTURAL RESEARCH SERVICE, ITHACA, N.Y. PLANT, SOIL AND NUTRITION LAB.		
Vanadium Determination in Biological Materials at Nanogram Levels by a Catalytic Method, W73-04409		
5A		

ORGANIZATIONAL INDEX

AQUA-CHEM, INC., WAUKESHA, WIS.

AQUA-CHEM, INC., WAUKESHA, WIS.
Reverse Osmosis for Waste Water Treatment:
What When,
W73-04187

SD

ARCTIC HEALTH RESEARCH CENTER,
FAIRBANKS, ALASKA.

Brucine Analysis for High Nitrate Concentrations,
W73-04000

SA

ARGONNE NATIONAL LAB., ILL.

Radiological Physics Division Annual Report.
Environmental Research, Jan.-Dec. 1971,
W73-04303

SA

Determination of Selected Trace Elements in
Natural Water Samples Using Spark Source
Mass Spectroscopy,
W73-04304

SA

Environmental Chemistry: Grand River Studies,
W73-04305

SB

Radionuclides in Lake Michigan Fish,
W73-04306

SA

ARIZONA STATE UNIV., TEMPE. DEPT. OF
CHEMISTRY; AND ARIZONA STATE UNIV.,
TEMPE. DEPT. OF GEOLOGY.

Mercury Detection by Means of Thin Gold
Films,
W73-04123

SA

ARIZONA UNIV., TUCSON.

Waste Heat Use in Controlled-Environment
Greenhouses,
W73-04345

SG

ARIZONA UNIV., TUCSON. DEPT. OF SOILS,
WATER AND ENGINEERING.

Solutions for Miscible Displacement of Soil
Water with Time-Dependent Velocity and
Dispersion Coefficients,
W73-04090

2G

ARIZONA UNIV., TUCSON. INST. OF ARID
LANDS RESEARCH.

Salinity Problems in Arid Lands Irrigation: A
Literature Review and Selected Bibliography,
W73-03910

3C

ARIZONA WATER RESOURCES RESEARCH
CENTER, TUCSON.

Development of Economic Water Harvest
Systems for Increasing Water Supply - Phase
II,
W73-03901

3B

ARKANSAS UNIV., FAYETTEVILLE. DEPT. OF
AGRONOMY.

Postharvest Cultural Practices Affecting the
Rooting of Kentucky Bluegrass Sods Grown on
Organic and Mineral Soils,
W73-04175

3F

ARKTICHESKII I ANTARKTICHESKII
NAUCHNO-ISSLEDOWATEL'SKII INSTITUT,
LENINGRAD (USSR).

Laser Applications in the Investigation of Ice-
Sheet Dynamics (O vozmozhnosti ispol'-
zovaniya lazerov dlya issledovaniya dinamiki
lednikovykh pohrov),
W73-04510

2C

ARKTICHESKII I ANTARKTICHESKII
NAUCHNO-ISSLEDOWATEL'SKII INSTITUT,
LENINGRAD (USSR).

Use of New Glacie Investigation Techniques
in Antarctica (Primeneniye novykh metodov

glyatsiologicheskikh issledovanii v Antark-
tide),
W73-04509

2C

Application of Lasers to Investigation of Glaci-
er Movement (Issledovaniye dinamiki dviz-
heniya lednikov s pomoshch'yu lazerov),
W73-04518

2C

ARMED FORCES INST. OF PATHOLOGY,
WASHINGTON, D.C.

Temperature Tolerance of Pathogenic and Non-
pathogenic Free-Living Amoebas,
W73-04330

SC

ARMOUR-DIAL, INC., CHICAGO, ILL.
Carbonate and Phosphate Detergent Builders:
Their Impact on the Environment,
W73-04440

SC

ARMY COASTAL ENGINEERING RESEARCH
CENTER, WASHINGTON D.C.

Exact Nonlinear Model of Wave Generator,
W73-04220

2E

ARMY ENGINEER DISTRICT, NEW ORLEANS,
LA.

Plaquemine Lock Closure, Mississippi River
and Tributaries Project, Iberville Parish, Louisi-
ana, Associated Water Features, Bayou
Plaquemine and Gulf Intracoastal Waterway
(Final Environmental Impact Statement).
W73-04457

8D

ARMY ENGINEER DISTRICT, PORTLAND, OREG.

N Sub 2--Threat to Pacific Northwest Fishes,
W73-04075

8I

ARMY ENGINEER WATERWAYS
EXPERIMENT STATION, VICKSBURG, MISS.

Model Studies of Navigation Improvements,
Columbia River Estuary: Report 2, Section 3,
Fixed-Bed Studies of Disposal Areas C and D,
W73-03915

8B

Effects of Proposed Runway Extensions at
Laguardia Airport on Tides, Currents, Shoal-
ing, and Dye Dispersion,
W73-04096

8B

Evaluation of Flared Outlet Transitions,
W73-04196

8B

Pertinent Data on Spillway Tainter Gates for
Corps of Engineers Projects,
W73-04377

8C

ATLANTIC RICHFIELD CO., PHILADELPHIA,
PA.

Corporate Checkpoints to Pollution Control,
W73-04483

SG

ATOMIC ENERGY COMMISSION,
WASHINGTON, D.C. (ASSIGNEE).

Treatment of Sewage,
W73-04139

SD

BALTIMORE GAS AND ELECTRIC CO., MD.

A Method for Minimizing Effects of Waste
Heat Discharges,
W73-04481

SG

BATTELLE COLUMBUS LABS., OHIO.

Bioenvironmental Safety Studies, Amchitka
Island, Alaska. Cannikin D + 2 Months Report,
W73-04317

SC

BATTELLE MEMORIAL INST., OHIO.

COLUMBUS LABS.
Evaluation of Herbicides for Possible Mu-
tagenic Properties,
W73-04233

SC

BATTELLE MEMORIAL INST., RICHLAND,
WASH. PACIFIC NORTHWEST LABS.

Surface Water Movement Studies Utilizing a
Tracer Dye Imaging System,
W73-03943

7B

Potential Thermal Effects of an Expanding
Power Industry: Columbia River Basin,
W73-04024

SC

BATTELLE-NORTHWEST, RICHLAND, WASH.
PACIFIC-NORTHWEST LAB.

Techniques for the Characterization of
suspended Sediment and Selected Applications
for the Acquired Data,
W73-04302

5B

BATTELLE-PACIFIC NORTHWEST LABS.,
RICHLAND, WASH.

Environmental Surveillance at Hanford for CY-
1971,
W73-04310

5A

An Independent View of the Use of Thermal
Power Station Cooling Water to Supplement
Inter-Regional Water Supply,
W73-04346

5G

BECHTEL FRANCE, PARIS.
Siting A Thermal Multi-Purpose Energy
Center,
W73-04021

5C

BEDFORD INST., DARTMOUTH (NOVA
SCOTIA).

Yearly Respiration Rate and Estimated Energy
Budget for Sagitta elegans,
W73-04400

5B

BETZ LABS., INC., TREVOSSE, PA.

Cooling Water Treatment-Where Do We Stand,
W73-04016

5D

Protective Measures for Cooling Systems in
Keeping with Water Quality Standards,
W73-04018

5D

BIOSPHERICS, INC., ROCKVILLE, MD.

(ASSIGNEE).
Internal Precipitation of Phosphate from Ac-
tivated Sludge,
W73-04131

5D

BIRMINGHAM UNIV. (ENGLAND). DEPT. OF
GEOLOGY AND GEOPHYSICS.

Methods for the Calculation of True Formation
Factors in the Bunter Sandstone of Northwest
England,
W73-04534

2F

BLACK AND VEATCH, KANSAS CITY, MO.

The Case for Higher Rate Waste Water Treat-
ment,
W73-04445

5D

BLACK AND VEATCH, KANSAS CITY, MO.

POWER DIV.
Logical Approaches to Power Supply and En-
vironment,
W73-04036

5G

BONNEVILLE POWER ADMINISTRATION,
PORTLAND, OREG.

Radio Interference From HVDC Converter
Stations,
W73-04084

8C

ORGANIZATIONAL INDEX

ANALYSIS OF TRANSMISSION LINE AUDIBLE NOISE LEVELS BASED UPON FIELD AND THREE-PHASE TEST LINE MEASUREMENTS.	W73-04085	8C	CALIFORNIA STATE COLL., LOS ANGELES. DEPT. OF MECHANICAL ENGINEERING. Rheology of Friction-Reducing Polymer Solutions,	W73-03913	8B	CALIFORNIA UNIV., RIVERSIDE. Influence of Various Treatments on the Dissolution of Dicalcium Phosphate in Soils,	W73-03974	SB
BRISTOL UNIV. (ENGLAND).			CALIFORNIA STATE UNIV., SAN JOSE. DEPT. OF CIVIL ENGINEERING AND APPLIED MECHANICS.			CALIFORNIA UNIV., RIVERSIDE. DEPT. OF VEGETABLE CROPS.		
Tidal Energy From the Bay of Fundy,	W73-04041	8A	Absorption of Water by a Soil from a Circular Cylindrical Source,	W73-04200	SB	A Temperature-Induced Transition in Mitochondrial Oxidation: Contrasts Between Cold and Warm-Blooded Animals,	W73-04027	SC
BRITISH COLUMBIA UNIV., VANCOUVER.			CALIFORNIA UNIV., BERKELEY.			CAMP DRESSER AND MCKEE, BOSTON, MASS.		
Dehydrated Poultry Waste in Poultry Rations,	W73-03992	5E	Soil Hydraulic Conductivity and Bulk Volume Changes During Cyclic Calcium-Sodium Exchange,	W73-03965	2K	Direct Filtration an Economic Answer to Water Treatment Needs,	W73-04446	SD
BRITISH LEATHER MANUFACTURERS' RESEARCH ASSOCIATION, EGHAM (ENGLAND).			Movements in Dams Due to Reservoir Filling,	W73-04073	8D	CANADIAN FORESTRY SERVICE, EDMONTON (ALBERTA).		
Tannery Effluents and Their Treatment - Part I,	W73-04550	5D	Recent Sediments of the Central California Continental Shelf, Pigeon Point to Sand Hills Bluffs: Part B. Mineralogical Data,	W73-03922	2J	Water Shortage in the Forest Floor of Subalpine Forests of Alberta,	W73-04169	4A
BROOKHAVEN NATIONAL LAB., UPTON, N.Y.			Forces Exerted by Waves Breaking Seaward of a Vertical Seawall,	W73-03925	8B	CANTERBURY UNIV., CHRISTCHURCH (NEW ZEALAND). DEPT. OF CIVIL ENGINEERING.		
A Physicochemical Rationale for the Biological Activity of Mercury and Its Compounds,	W73-04054	5C	CALIFORNIA UNIV., BERKELEY. COLL. OF ENGINEERING.			Seepage From Shallow Reservoir,	W73-04221	4A
BUREAU OF COMMERCIAL FISHERIES, ANN ARBOR. GREAT LAKES FISHERY LAB.			Recent Sediments of the Central California Continental Shelf, Pigeon Point to Sand Hills Bluffs: Part B. Mineralogical Data,	W73-03922	2J	Dispersion From Pit in Uniform Seepage,	W73-04222	5B
Factors of Ecologic Succession in Oligotrophic Fish Communities of the Laurentian Great Lakes,	W73-04399	5C	Forces Exerted by Waves Breaking Seaward of a Vertical Seawall,	W73-03925	8B	CARNEGIE-MELLON UNIV., PITTSBURGH, PA.		
BUREAU OF COMMERCIAL FISHERIES, SEATTLE, WASH.			CALIFORNIA UNIV., BERKELEY. ENVIRONMENTAL PHYSIOLOGY LAB.			Chromatographic Detection of Water Contaminants,	W73-04423	SA
Thermal Effects Studies on the Lower Columbia River, 1968-70,	W73-04331	5C	An Atomic Absorption Method for Cation Measurements in Kjeldahl Digests of Biological Materials,	W73-04251	5A	CASE WESTERN RESERVE UNIV., CLEVELAND, OHIO.		
BUREAU OF RECLAMATION, DENVER, COLO. REGION 7.			CALIFORNIA UNIV., DAVIS.			Electronic Detection of Serac Avalanches and Glacier Noise at Vaughan Lewis Icefall, Alaska,	W73-03929	2C
Irrigation Guesswork - Goodbye,	W73-03962	3F	A Computer Analysis on the Leaching of Boron From Stratified Soil Columns,	W73-03967	2G	CATFISH FARMERS OF AMERICA, LAUREL, MISS.		
BUREAU OF RECLAMATION, MINOT, N.DAK.			Sprinkler use for Swine Cooling,	W73-04266	3E	Catfish Farming - Beneficial Use of Waste Heat,	W73-04341	5G
Available Water Capacity of Sandy and Gravelly North Dakota Soils,	W73-04109	2G	CALIFORNIA UNIV., DAVIS. DEPT. OF AGRICULTURAL ECONOMICS.			CENTER FOR DISEASE CONTROL, ATLANTA, GA.		
BUREAU OF RECLAMATION, MONTROSE, COLO.			Learning, External Benefits, and Subsidies in Water Desalination,	W73-04274	6B	Salmonellae as an Index of Pollution of Surface Waters,	W73-04426	5A
Planning Concrete Dam Construction Control Surveys,	W73-04077	8A	CALIFORNIA UNIV., DAVIS. DEPT. OF WATER SCIENCE AND ENGINEERING.			CENTER FOR THE ENVIRONMENT AND MAN, INC., HARTFORD, CONN.		
BUREAU OF SPORT FISHERIES AND WILDLIFE, SANDUSKY, OHIO. BIOLOGICAL STATION.			Horizontal Infiltration into Layered Soils,	W73-04092	2G	A Procedure and Case Study Demonstrations for Evaluating the Cost of Thermal Effluent Control for Proposed Steam-Electric Generating Units,	W73-04070	5G
Limnology and Fish Ecology of Sockeye Salmon Nursery Lakes of the World,	W73-04405	5C	CALIFORNIA UNIV., LIVERMORE. LAWRENCE RADIATION LAB.			A Procedure for Estimating Costs of Thermal Effluent Modifications for Existing Steam-Electric Generating Stations,	W73-04071	5G
BUSINESS DYNAMICS CORP., PHOENIX, ARIZ.			Concentration Factors of Chemical Elements in Edible Aquatic Organisms,	W73-04125	5C	CENTRAL GROUNDWATER BOARD, NAGPUR (INDIA).		
Starting with Trickle Irrigation,	W73-03958	3C	CALIFORNIA UNIV., LOS ANGELES.			An Attempt at Estimating the Transmissibilities of Trappean Aquifers from Specific Capacity Values,	W73-04527	2F
CALGON CORP., PITTSBURGH, PA. WATER MANAGEMENT DIV.			Movement of Water in Glaciers,	W73-03936	2C	CENTRAL LAB. TNO, DELFT (NETHERLANDS).		
Inhibiting Water Formed Deposits with Threshold Compositions,	W73-04166	5D	CALIFORNIA UNIV., LOS ANGELES. LAB. OF NUCLEAR MEDICINE AND RADIATION BIOLOGY.			Mercury in the Environment - Techniques of Analysis (XIII. Analysetechnieken voor Kwik in Het Milieu),	W73-04046	5A
CALIFORNIA STATE COLL., LONG BEACH.			Radioecology and Ecophysiology of Desert Plants at the Nevada Test Site,	W73-04300	5C			
Marine and Estuarine Pollution,	W73-04237	5A	CALIFORNIA UNIV., LOS ANGELES. WATER RESOURCES CENTER.					
			Data Record for Public Attitudes Toward Reuse of Reclaimed Water,	W73-04059	6B			

ORGANIZATIONAL INDEX

CENTRAL PUBLIC HEALTH ENGINEERING INST., AHMEDABAD

CENTRAL PUBLIC HEALTH ENGINEERING RESEARCH INST., AHMEDABAD (INDIA).	
FIELD CENTRE.	
Rational Process Design Standards for Aerobic Oxidation Ponds in Ahmedabad, India, W73-04496	5D
CENTRAL PUBLIC HEALTH ENGINEERING RESEARCH INST., NAG PUR (INDIA).	
Performance of Deep Trickling Filters by Five Methods, W73-04486	5D
CENTRE DE RECHERCHES DE L'ONNMIUM D'ASSEINEMENT, COLOMBES (FRANCE).	
Study of the Metabolization of Pollutant Products, W73-04402	5B
CENTRO SPERIMENTALE PER L'AGRICOLTURA FORESTALE, ROME (ITALY).	
Determination of Water Stress of Eucalypts in the Field, W73-04485	2I
CHEMAP A.G., MANNEDORF (SWITZERLAND).	
Mercury Pollution, W73-04055	5B
CHUVASH STATE UNIV., CHEBOKSARY (USSR).	
A High-Selective Titration Method for Determining Copper with 2,2-Bicinchoninic Acid (In Russian), W73-04248	5A
CINCINNATI UNIV., OHIO. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.	
A Comparative Study of the Inactivation of Viruses in Water by Chlorine, W73-03991	5F
COAST GUARD, WASHINGTON, D.C. OFFICE OF RESEARCH AND DEVELOPMENT.	
Determination of Sea Ice Drift Using Side-Looking Airborne Radar, W73-03951	7B
COLD REGIONS RESEARCH AND ENGINEERING LAB., HANOVER, N.H.	
Radar Cross-Section Measurements of Snow and Ice, W73-03920	2C
Utilization of Deep Water Heat in Reservoirs for the Maintenance of Unfrozen Water Areas, W73-04043	2C
Performance of a Frost-Tube for Determination of Soil Freezing and Thawing Depths, W73-04254	7B
COLORADO STATE UNIV., FORT COLLINS.	
Stochastic Structure of Water Use Time Series, W73-04098	4A
COLORADO STATE UNIV., FORT COLLINS. DEPT. OF AGRICULTURAL ENGINEERING.	
Center Pivot Irrigation, W73-03978	3F
COLORADO STATE UNIV., FORT COLLINS. DEPT. OF CIVIL ENGINEERING.	
Sheet Flow Under Simulated Rainfall, W73-03921	2B
On the Time When the Extreme Flood Occurs, W73-04210	2E
Roughness in a Model of Overland Flow, W73-04508	8B
COLORADO STATE UNIV., FORT COLLINS. DEPT. OF MECHANICAL ENGINEERING.	
Finite-Element Stress Analysis of Avalanche Snowpacks, W73-03928	2C
COLORADO STATE UNIV., FORT COLLINS. ENVIRONMENTAL RESOURCES CENTER.	
Selection of Test Variable for Minimal Time Detection of Basin Response to Natural or Induced Changes, W73-04061	4A
COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, ADELAIDE (AUSTRALIA). DIV. OF SOILS.	
Comparison of Recharge to Groundwater Under Pasture and Forest Using Environmental Tritium, W73-04373	2F
Water Table Fluctuations Under Forest and Pasture in a Karstic Region of Southern Australia, W73-04374	2F
COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANIZATION, CANBERRA (AUSTRALIA). DIV. OF PLANT INDUSTRY.	
Hydrostatics in Swelling Soils and Soil Suspensions: Unification of Concepts, W73-03982	8D
CONNECTICUT AGRICULTURAL EXPERIMENT STATION, NEW HAVEN.	
Theory of Water Movement in Soils: 4. Two and Three Dimensional Steady Infiltration, W73-04106	2G
Theory of Water Movement in Soils: 5. Unsteady Infiltration From Spherical Cavities, W73-04225	2G
Photosynthetic Response to Drought in Maize, W73-04260	3F
CORNELL UNIV., ITHACA, N.Y.	
Some Generalized Characteristics of the Floods and Droughts of the Lower Mekong, W73-04380	2E
CORNELL UNIV., ITHACA, N.Y. SCHOOL OF CIVIL AND ENVIRONMENTAL ENGINEERING.	
Wave Effect and Eddy Diffusivity in the Air near a Water Surface, W73-04209	2E
CORPS OF ENGINEERS, ATLANTA, GA, SOUTH ATLANTIC DIV.	
Regional Inventory Report-South Atlantic-Gulf Region, Puerto Rico and the Virgin Islands. W73-04228	8B
CROWN ZELLERBACH CORP., SAN FRANCISCO, CALIF.	
Water Pollution Control in Pulp and Paper Industry, W73-04424	5D
DELAWARE UNIV., NEWARK. DEPT. OF CHEMICAL ENGINEERING.	
The Structure of Liquid Water, W73-03903	2K
DELAWARE UNIV., NEWARK. DEPT. OF GEOLOGY.	
Sedimentation on Shell Banks in Delaware Bay, W73-04226	2L
DELAWARE UNIV., NEWARK. WATER RESOURCES CENTER.	
Water Use Efficiency of Vegetable Crops Grown over Asphalt Moisture Barriers, W73-03902	3F
DELHI UNIV. (INDIA). DEPT. OF CHEMISTRY.	
Titrimetric Microdetermination of Zinc With EDTA Using 1,5-Di-Beta-Naphthylthiocarbazone (HNDZ) as an Extractive Indicator, W73-04231	5A
DENVER SEWAGE SLUDGE DISPOSAL DISTRICT, COLO.	
Experiences with the Sludge Program in the Denver area, W73-04285	5D
DEPARTMENT OF AGRICULTURE, AGASSIZ (BRITISH COLUMBIA). RESEARCH STATION.	
Factors Affecting Plant Uptake and Phytotoxicity of Cadmium Added to Soils, W73-04058	5B
DEPARTMENT OF AGRICULTURE, FERNTRIE GULLY (VICTORIA). SCORESBY HORTICULTURAL RESEARCH STATION.	
Determination of a Water Table in a Soil Profile Using the Platinum Oxygen Cathode, W73-03985	2G
DEPARTMENT OF AGRICULTURE, OTTAWA (ONTARIO). PLANT RESEARCH INST.	
Geographical Variations in Yield-Weather Relationships Over A Large Wheat Growing Region, W73-04171	3F
DEPARTMENT OF AGRICULTURE, SUMMERLAND (BRITISH COLUMBIA). RESEARCH STATION.	
Flow of Water into Ceramic Tubes Simulating Root Systems, W73-04271	2I
DEPARTMENT OF ENERGY, MINES AND RESOURCES, BURLINGTON (ONTARIO). CANADA CENTER FOR INLAND WATERS.	
Thermal Scanner Observations over Lake Ontario, W73-03949	7B
DEPARTMENT OF LANDS AND FORESTS, THUNDER BAY (ONTARIO). RESEARCH BRANCH.	
The Limnology and Fishes of Oligotrophic Glacial Lakes in North America (About 1800 A.D.), W73-04401	5C
DEPARTMENT OF THE ENVIRONMENT, OTTAWA (ONTARIO). WATER MANAGEMENT SERVICE.	
Thermal and Mineral Springs in the Southern Rocky Mountains of Canada, W73-04363	4B
DIVISION OF RADIOLOGICAL AND ENVIRONMENTAL PROTECTION (AEC), WASHINGTON, D.C.	
Russian Radioecology. A Bibliography of Soviet Publications with Citations of English Translations and Abstracts, W73-04298	5B
DUKE UNIV., BEAUFORT, N.C. MARINE LAB.	
Mercury Concentration in Recent and Ninety-Year-Old Benthopelagic Fish, W73-04122	5B

ORGANIZATIONAL INDEX

GEOLOGICAL SURVEY, COLUMBIA, S.C.

EASTERN REGIONAL RESEARCH LAB., PHILADELPHIA, PA.			
Efficiency of <i>Salmonella</i> Isolation from Meat and Bone Meal of One 300-g Sample Versus Ten 30-g Samples,			
W73-04247	5A		
ECODYNE CORP., CHICAGO, ILL. (ASSIGNEE).			
Method and Apparatus for Water Softening,			
W73-04145	3A		
EFFLUENT CONTROL LTD., BIRMINGHAM (ENGLAND).			
Effluent Standards From the Viewpoint of the Industrialist,			
W73-04493	5G		
EMSCHE GENOSSENSCHAFT, ESSEN (WEST GERMANY).			
Studies on the Design Data of Gravity Thickening,			
W73-04433	5D		
EMSCHERGENOSSENSCHAFT, ESSEN (WEST GERMANY).			
Thermal Conditioning Tests of Activated Sludge and Anaerobic Digestion Test of the Filtrates,			
W73-04476	5D		
ENTE NAZIONALE PER L'ENERGIA ELECTRICA, MILAN (ITALY).			
Automatic Designing of Transmission Lines and Substations,			
W73-04079	8C		
ENVIRONMENT CONSULTANTS, INC., DALLAS, TEX.			
A New Topological Relationship as an Indicator of Drainage Network Evolution,			
W73-04203	4A		
ENVIRONMENT CONSULTANTS, INC., NEW YORK.			
Seasonal Sediment Yield Patterns of U.S. Rivers,			
W73-04205	2J		
ENVIRONMENTAL DYNAMICS, INC., LOS ANGELES, CALIF.			
Optimal Pricing Policies for Conjunctive Urban Water Supply and Waste Water Treatment Systems,			
W73-04060	5G		
ENVIRONMENTAL PREDICTION RESEARCH FACILITY (NAVY), MONTEREY, CALIF.			
Numerical Modeling of the Growth of Ice Crystals, Graupel, and Hail,			
W73-04104	2C		
ENVIRONMENTAL PROTECTION AGENCY, BELTSVILLE, MD. PESTICIDES REGULATIONS DIV.			
Thin Layer Chromatographic Detection of Chlorinated Hydrocarbons as Cross-Contaminants in Pesticide Formulations,			
W73-04396	5A		
ENVIRONMENTAL PROTECTION AGENCY, CINCINNATI, OHIO.			
Microbiology of Water,			
W73-04235	5B		
Radiological Surveillance at Pressurized Water Reactors,			
W73-04325	5B		
ENVIRONMENTAL PROTECTION AGENCY, DALLAS, TEX. AIR AND WATER PROGRAMS DIV.			
Construction of Wastewater Facilities, Red Oak, Texas (Final Environmental Impact Statement),			
W73-04468	5G		
ENVIRONMENTAL PROTECTION AGENCY, RESEARCH TRIANGLE PARK, N.C. DIV. OF METEOROLOGY.			
Large Power Plant Effluent Study (Lappes) Volume 3 - Instrumentation, Procedures, and Data Tabulations (1970),			
W73-04121	5A		
ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, D.C., OFFICE OF WATER PROGRAMS.			
Water Pollution. Freshwater Macroinvertebrates,			
W73-04238	5C		
ENVIRONMENTAL SCIENCES, INC., BERKELEY HEIGHTS, N.J. (ASSIGNEE).			
Tertiary Filtering Arrangement,			
W73-04144	5D		
ENVIROTECH CORP., PALO ALTO, CALIF. (ASSIGNEE).			
Wastewater Treatment Sequence,			
W73-04146	5D		
ESSEX RIVER AUTHORITY (ENGLAND).			
Effluent Standards and Water Reuse,			
W73-04425	5D		
FEDERAL WATER POLLUTION CONTROL ADMINISTRATION, WASHINGTON, D.C.			
Conference in the Matter of Pollution of the Interstate Waters of the Merrimack and Nashua Rivers and Their Tributaries, Massachusetts-New Hampshire and the Intrastate Portions of Those Waters Within the State of Massachusetts.			
W73-04469	5G		
FENCO, TORONTO (ONTARIO).			
Uplift Computations for Hollow Gravity Dams,			
W73-04083	8A		
FISHERIES RESEARCH BOARD OF CANADA, NANAIMO (BRITISH COLUMBIA).			
BIOLOGICAL STATION.			
Effects of Acclimation and Acute Temperature Experience on the Swimming Speed of Juvenile Coho Salmon,			
W73-04243	5C		
FLORIDA POWER AND LIGHT CO., MIAMI.			
Power Plant Cooling Systems,			
W73-04029	5D		
FLORIDA UNIV., GAINESVILLE. COLL. OF PHARMACY.			
Electronic Spectra of 2-Aminoquinoline and 4-Aminoquinidine. Evidence for the Cyclic Amidine Structure of the Singly Protonated Cations,			
W73-04389	5A		
FOREST SERVICE (USDA), GLEN DORA, CALIF. PACIFIC SOUTHWEST FOREST AND RANGE EXPERIMENT STATION.			
Using Canonical Correlation for Hydrological Predictions,			
W73-04381	2E		
FOREST SERVICE (USDA), WENATCHEE, WASH. FOREST HYDROLOGY LAB.			
Predicting Soil Moisture in the Southern Appalachians,			
W73-04086	2G		
FORT WORTH WATER DEPT., TEX.			
Water Treatment Plant for Today and Tomorrow,			
W73-04435	5D		
FREIGHTON SULPHUR CO., TEX.			
Pollution Control in Sulphur Mining,			
W73-04498	5D		
FREIBURG UNIV. (WEST GERMANY).			
INSTITUT FUER BIOLOGISCHE HOLZFORSCHUNG.			
Method for the Direct Measurement of Absolute Water Consumption of Woody Plants (In German),			
W73-04177	2I		
GENERAL ELECTRIC CO., SCHENECTADY, N.Y. (ASSIGNEE).			
Combined Steam Power Plant and Water Distillation System,			
W73-04140	3A		
GENERAL ELECTRIC CO., SCHENECTADY, NEW YORK.			
Trends of Power Generation and Thermal Discharges in New York State,			
W73-04338	5G		
GENERAL SERVICES ADMINISTRATION, WASHINGTON, D.C.			
Former Camp Parks Sewage Disposal Plant, Parcel A-2 Pleasanton, California (Final Environmental Impact Statement).			
W73-04474	5G		
GENEVA CANTONAL LAB. OF CHEMISTRY (SWITZERLAND).			
Determination of Hydrocarbon Residues in Water,			
W73-04007	5A		
GEOLOGICAL SURVEY, BATON ROUGE, LA.			
Ground Water in the Plaquemine-White Castle Area, Iberville Parish, Louisiana,			
W73-04502	4B		
Water Resources of Union Parish, Louisiana,			
W73-04503	4B		
Water Resources of Ouachita Parish, Louisiana,			
W73-04504	4B		
GEOLOGICAL SURVEY, CARSON CITY, NEV.			
Bathymetric Reconnaissance of Mariette and Spooner Lakes, Washoe County and Carson City, Nevada,			
W73-04100	7C		
Bathymetric Reconnaissance of Topaz Lake, Nevada and California,			
W73-04192	7C		
Bathymetric Reconnaissance of Rye Patch Reservoir and the Pitt-Taylor Reservoirs, Pershing County, Nevada,			
W73-04227	7C		
GEOLOGICAL SURVEY, COLUMBIA, S.C.			
A Reconnaissance of the Winyah Bay Estuarine Zone, South Carolina,			
W73-04095	7C		

ORGANIZATIONAL INDEX

GEOLOGICAL SURVEY, DENVER, COLO.

Ground-Water Levels in the South Platte River Valley of Colorado, 1968-72, W73-04211 7C

Selenium Accumulation in Soils and It's Absorption by Plants and Animals, W73-04272 5C

GEOLOGICAL SURVEY, FORT COLLINS, COLO.

Hurst Phenomenon in Turbulence, W73-04206 2E

GEOLOGICAL SURVEY, HARTFORD, CONN.
Gazetteer of Natural Drainage Areas of Streams and Water Bodies within the State of Connecticut, W73-03914 7C

GEOLOGICAL SURVEY, LAKWOOD, COLO.
Water Inflow into Hole UA-1, Amchitka Island, Alaska, W73-03919 5A

GEOLOGICAL SURVEY, OKLAHOMA CITY, OKLA.
Unit-Response Method of Open-Channel Flow Routing, W73-04215 8B

GEOLOGICAL SURVEY, PHOENIX, ARIZ.
Hydrologic Regimen of Lower Tonto Creek Basin, Gila County, Arizona--A Reconnaissance Study, W73-04099 3B

GEOLOGICAL SURVEY, RALEIGH, N.C.
Rainfall and Runoff in Urban Areas--A Case Study of Flooding in the Piedmont of North Carolina, W73-04356 4C

GEOLOGICAL SURVEY, TACOMA, WASH.
Periodic Surge Origin of Folded Medial Moraines on Bering Piedmont Glacier, Alaska, W73-03935 2C

Microwave Emission From Snow--A Progress Report, W73-03950 7B

GEOLOGICAL SURVEY, TALLAHASSEE, FLA.
Hydrologic Aspects of Freshening Upper Old Tampa Bay, Florida, W73-04094 2H

Flood of September 20-23, 1969, in the Gadsden County Area, Florida, W73-04535 2E

Construction of Waste-Injection Monitor Wells Near Pensacola, Florida, W73-04536 5E

A Hydrologic Description of Lake Magdalene Near Tampa, Florida, W73-04537 7C

GEOLOGICAL SURVEY, WASHINGTON, D.C.
Quality of Surface Waters of the United States, 1967: Parts 9-11. Colorado River Basin to Pacific Slope Basins in California, W73-03924 7C

Energy Resources of the United States, W73-04039 6G

Water Supply for the Nuclear Rocket Development Station at the U.S. Atomic Energy Commission's Nevada Test Site, W73-04370 4B

Ground Water Reconnaissance in the Arghandab River Basin Near Kandahar, Afghanistan, W73-04379 4B

Fluvial-Sediment Discharge to the Oceans from the Conterminous United States, W73-04526 2J

GEORGIA INST. OF TECH., ATLANTA. ENGINEERING EXPERIMENT STATION.

Evaluation of Treatment Plants by Tracer Methods. Annual Report, Jan. 1971-Jan. 1972, W73-04297 5B

GEORGIA UNIV., ATHENS. DEPT. OF CHEMISTRY.

High Sensitivity Thermochemical Analysis, W73-04420 7B

GHENT RIJKSUNIVERSITEIT (BELGIUM). LABORATORIUM VOOR HYDRAULICA.

The Lateral Inflow into Submerged Drains, W73-04384 8B

GHH-MAN TECHNIK GESELLSCHAFT FUER ANLAGENBAU M.B.H., ESSEN (WEST GERMANY).

Method and Apparatus for Softening or Desalting Water by Ion Exchange, W73-04133 3A

GIFU COLL. OF PHARMACY (JAPAN).

Studies of Nitrogen Compounds in Waters: I. Separate of Nitrate and Nitrite Nitrogen in Waste Waters (In Japanese), W73-04188 5D

GILBERT ASSOCIATES, INC., READING, PA.

Circulating Water Systems Without Valves, W73-04035 5D

GOSUDARSTVENNYI NAUCHNO-ISSLEDOVATELSKII INSTITUT OZERNOGO I RECHNOGKHOZYAISTVA, LENINGRAD (USSR).

Production of Mass Forms of Planktonic Crustaceans in Lake Ilmen (In Russian), W73-04548 2H

GUELPH UNIV. (ONTARIO). SCHOOL OF ENGINEERING.

A Sampling Scheme for Shallow Snowpacks, W73-04386 7B

GULF GENERAL ATOMIC CO., SAN DIEGO, CALIF.

Activation analysis of Heavy Metals in Surface Waters Using Ion Exchange Filter Paper and Cyanide Complexing, W73-04329 5A

GULF GENERAL ATOMIC, INC., SAN DIEGO, CALIF.

Reverse Osmosis Can Cut Cost of Water Treatment, W73-04549 5D

GULF SOUTH RESEARCH INST., NEW ORLEANS, LA. ENVIRONMENTAL VIROLOGY AND MICROBIOLOGY SECTION.

Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters, W73-04390 5F

Newer Membrane Concentration Processes and Their Application to the Detection of Viral Pollution of Waters, W73-04478 5D

HAILE SELASSIE I UNIV., ADDIS ABABA, (ETHIOPIA).

Some Coordination Effects in Natural Waters of Ethiopia, W73-04529 2K

HARWOOD BEEBE CO.

Award Winning Water Treatment Plant Features Automation, W73-04447 5D

HARYANA AGRICULTURAL UNIV., HISSAR (INDIA). DEPT. OF PHYSICS.

Non-Linear Thermodynamics of Soil-Water-Heat Systems, W73-03960 2G

Thermodynamics of Soil-Water System, W73-03961 2G

HASWELL (CHARLES) AND PARTNERS, LONDON (ENGLAND).

Pumped Storage and Tidal Power in Energy Systems, W73-04033 5G

HAWAII UNIV., HONOLULU. DEPT. OF AGRICULTURAL ENGINEERING.

Optimal Design of Furrow Length of Surface Irrigation, W73-03975 3F

HAWAII UNIV., HONOLULU. DEPT. OF ECONOMICS; AND HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.

Opportunity Costs of a Transbasin Diversion of Water 1. Methodology, W73-04276 4A

HAWAII UNIV., HONOLULU. WATER RESOURCES RESEARCH CENTER.

A Study of Water Institutions of Hawaii, W73-04062 6B

Wastewater Reclamation by Irrigation, W73-04480 5D

HEBREW UNIV., JERUSALEM (ISRAEL).

Transient Infiltration into Crust-Topped Profiles, W73-03976 2G

Spatial Analysis of Rainfall Data from Dense Networks, W73-04383 7C

The Spottiness of Rainfall in a Desert Area, W73-04532 2B

HEBREW UNIV., REHOVOTH (ISRAEL).

FACULTY OF AGRICULTURE.

Isothermal Drying of Structurally Layered Soil Columns, W73-04256 2D

HOKKAIDO UNIV., SAPPORO (JAPAN). INST. OF LOW TEMPERATURE SCIENCE.

Grain-Boundary Energy and Grain-Boundary Groove Angles in Ice, W73-03930 2C

HOLSTEIN AND KAPPERT MASCHINENFABRIK PHONIX G.M.B.H., DORTMUND (WEST GERMANY). PROCESS ENGINEERING DIV.

Recover Salable Products from Waste Yeast, W73-04014 5D

ORGANIZATIONAL INDEX

KIEL UNIV. (WEST GERMANY). HYGIENE-INSTITUT.

HONEYWELL, INC., MINNEAPOLIS, MINN. (ASSIGNEE). Electrochemical Oxygen Demand System, W73-04147	5A	INSTITUTE OF HYDROLOGY, WALLINGFORD (ENGLAND). FLOODS STUDY TEAM. An Index of Flood-Producing Rainfall Based on Rainfall and Soil Moisture Deficit, W73-04528	2A	JOHNS HOPKINS UNIV., BALTIMORE, MD. DEPT. OF GEOGRAPHY AND ENVIRONMENTAL ENGINEERING. A Review of the Arsenic Cycle in Natural Waters, W73-04541	5B
ILLINOIS STATE GEOLOGICAL SURVEY, URBANA. Electrical Earth Resistivity Surveying in Land- fill Investigations, W73-03918	5B	INSTITUTE OF MEDICAL PARASITOLOGY AND TROPICAL MEDICINE, MOSCOW (USSR). Lysimetric Method of Examining the Degree of Dehelminthization of Sewage (In Russian), W73-04448	5D	JOHNS-MANVILLE CORP., NEW YORK (ASSIGNEE). Method of Water Filtration, W73-04132	5D
Depositional Patterns, Facies, and Trace Ele- ment Accumulation in the Waukegan Member of the Late Pleistocene Lake Michigan Forma- tion in Southern Lake Michigan, W73-04361	2J	INSTITUTO DE INVESTIGACIONES GEOLOGICAS, EDAFOLOGICAS Y AGROBIOLOGICAS DE GALICIA, SANTIAGO (SPAIN). Evapotranspiration and Potential Evapotran- spiration Measures in Santiago de Compostela (Spain), W73-04028	2D	KANSAS STATE UNIV., MANHATTAN. DEPT. OF CHEMICAL ENGINEERING. Kinetic Behavior of Mixed Populations of Ac- tivated Sludge, W73-04441	5D
ILLINOIS STATE WATER SURVEY, URBANA. Study of Rainout of Radioactivity in Illinois. W73-04052	5B	INSTITUTUL DE STUDII SI PROIECTARI HIDROENERGETICE, BUCHAREST (ROMANIA). Researches on Removal of Colloidal Matter From Waste Water Produced in Sanitary Por- celain Ware and Ceramic Industry, W73-03990	5D	KANSAS STATE UNIV., MANHATTAN. DIV. OF BIOLOGY. Effects of Soil Texture on Evaporative Loss and Available Water in Semi-Arid Climates, W73-03952	2D
ILLINOIS STATE WATER SURVEY, WARRENVILLE. Thermal Pollution of Ground Water by Artifi- cial Recharge, W73-04038	5B	INTERNATIONAL PAPER CO., NEW YORK. Elements of Selection for Secondary Waste Treatment Systems, W73-04287	5D	KASPIISKII NAUCHNO-ISSLEDOVATELSKII INSTITUT RYBNOGO KHOZYAISTVA, ASTRAKHAN (USSR). The Significance of the Rivers of the Volga Delta in the Spawning of Fish (In Russian), W73-04522	2I
IMPERIAL COLL. OF SCIENCE AND TECHNOLOGY, LONDON (ENGLAND). DEPT. OF CIVIL ENGINEERING. Unified Nondimensional Formulation for Open Channel Flow, W73-04223	8B	INTERUNIVERSITAIR REACTOR INSTITUUT, DELFT (NETHERLANDS). Mercury in Fish - Imported Tinned Fish, (IX. Kwikkelenen van een Aantal Sorten Ingelakte Vis), W73-04045	5C	KELLOG (M. W.) CO., NEW YORK. Optimizing an Activated Carbon Wastewater Treatment Plant, W73-04421	5D
INDIAN ASSOCIATION FOR THE CULTIVATION OF SCIENCE, CALCUTTA. DEPT. OF PHYSICAL CHEMISTRY. Extraction of Anions into Chloroform by Sur- factant Cations. Relevance to Dye Extraction Method of Analysis of Long Chain Amines, W73-04408	5A	Activation Analysis Trace-Element Studies fo Marine Biological Samples, W73-04327	5A	KENTUCKY UNIV., LEXINGTON. A Rapid Method of Measurement of Diffusion Coefficients in Aqueous Solutions, W73-03966	2K
INDIANA UNIV., BLOOMINGTON. DEPT. OF CHEMISTRY. New, Directly Digital Automatic Titration Ap- paratus, W73-04252	7B	ISOTOPTENKNISKA LABORATORIET, STOCKHOLM (SWEDEN). Activation Analysis of Mercury and Other En- vironmental Pollutants in Water and Aquatic Ecosystems, W73-04051	5A	Anion Exclusion Effects on Chloride Move- ment in Soils, W73-03973	2K
INSTITUT EKSPERIMENTALNOI I KLINICHESKOI ONKOLOGII, MOSCOW (USSR). Navigation as One Source of Pollution of Water Basins by Carcinogenic Hydrocarbons (In Russian), W73-04186	5B	JADAIR, INC., PORT WASHINGTON, WIS. (ASSIGNEE). Method and Apparatus for Clarifying Liquids, W73-04152	5D	KENTUCKY UNIV., LEXINGTON. DEPT. OF AGRICULTURAL ENGINEERING. Comparison of Multiple Regression and Prin- cipal Component Regression for Predicting Water Yields in Kentucky, W73-04199	4A
INSTITUT ROYAL METEOROLOGIQUE DE BELGIQUE, BRUSSELS. Interception of Rain by Forest Vegetation-Esti- mation of Daily Interception Using a Mathe- matical Model (Interception de la pluie par la vegetation forestiere—estimation de l'intercep- tion journaliere a l'aide d'un modele mathe- matique), W73-04530	2A	JAMES COOK UNIV. OF NORTH QUEENSLAND, TOWNSVILLE (AUSTRALIA). DEPT. OF ENGINEERING. Longitudinal Dispersion in Sinuous Channels, W73-04214	5B	Rainfall and Runoff in Urban Areas: Theory and Prediction, W73-04357	4C
INSTITUTE FOR MARINE ENVIRONMENTAL RESEARCH, PLYMOUTH (ENGLAND). The Instability of Ocean Populations, W73-04240	5C	JOHN F. KENNEDY SCHOOL OF GOVERNMENT, CAMBRIDGE, MASS. Combined use of Optimization and Simulation Models in River Basin Planning, W73-04275	6A	Erosion Sediment Production, W73-04358	2J
INSTITUTE OF FRESHWATER RESEARCH, DROTNINGHOLM (SWEDEN). Effects of Introductions of Salmonids into Bar- ren Lakes, W73-04406	5C	JOHNS HOPKINS UNIV., BALTIMORE, MD. CHESAPEAKE BAY INST. A Report on the Prototype Data Collected in the Potomac River for the Chesapeake Bay Model Study, W73-04101	2L	KENTUCKY UNIV., LEXINGTON. DEPT. OF GEOGRAPHY. The Urban Climate, W73-04355	4C
				KIEL UNIV. (WEST GERMANY). GEOLOGISCHE-PALÄONTOLOGISCHE INSTITUT UND MUSEUM. Geological and Archaeological Investigation of the Mode of Origin of the Marshes in Nord- friesland (Germany), (In German), W73-04229	2L
				KIEL UNIV. (WEST GERMANY). HYGIENE-INSTITUT. Ozone Active Carbon Treatment of Sea Water for Swimming Pools, (In German), W73-04411	5D

ORGANIZATIONAL INDEX

KINGS COLL., LONDON (ENGLAND). DEPT. OF ZOOLOGY.

KINGS COLL., LONDON (ENGLAND). DEPT. OF ZOOLOGY.
Lampreys and Teleost Fish, Other than Whitebait, in the Polluted Thames Estuary,
W73-0426 5C

KOMENSKEHO UNIVERSITA, BRATISLAVA (CZECHOSLOVAKIA). INST. OF CHEMISTRY.
Relation Between Retention Indices and Boiling Points of Hydrocarbons Differing Slightly in Their Vapor Pressures,
W73-04417 5A

LAGOS UNIV. (NIGERIA). DEPT. OF CIVIL ENGINEERING.
Principle of Maximum Entropy in Hydrologic Frequency Analysis,
W73-04531 7C

LANDWIRTSCHAFTLICHE FORSCHUNGSANSTALT, BUENTEHOF (GERMANY).
The Concentration of K, Ca, and Mg in the Saturation Extract in Relation to Exchangeable K, Ca, and Mg,
W73-03970 2K

LATVIAN STATE UNIV., RIGA.
Structure and Development of Valleys in the Daugava River Basin (Stroyeniye i razvitiye dolin basseyna reki Daugava),
W73-04512 2J

LEHIGH UNIV., BETHLEHEM, PA. CENTER FOR THE APPLICATION OF MATHEMATICS.
The Interaction of Large Amplitude Shallow-Water Waves With an Ambient Shear Flow: Non-Critical Flows,
W73-04540 2E

LIEGE UNIV. (BELGIUM). DEPT. OF BOTANY.
Concerning Conservation of the Hohe Mark Forest Massif and of the High Valleys of the Schwalm and Its Tributaries at Elsenborn,
W73-04523 6G

LONG BEACH DEPT. OF OIL PROPERTIES, CALIF.
Elevation Changes Due to Tides, Long Beach, Calif.,
W73-04369 4B

LOS ANGELES COUNTY SANITATION DISTRICT, CALIF.
Waste Water Reuse-A Supplemental Supply,
W73-03987 5D

LOUGHRY AGRICULTURAL COLL., COOKSTOWN (NORTHERN IRELAND).
Effects of Irrigation, Manganese Sulphate and Sulphur Applications on Common Scab of the Potato,
W73-04167 5G

Common Potato Scab: Effects of Irrigation, Manganese Sulphate and Sulphur Treatments for Common Potato Scab on Mineral Composition of Plant Material and Soil Extracts,
W73-04168 5G

LOUISIANA STATE UNIV., BATON ROUGE. COASTAL STUDIES INST.
The Sediments and Sedimentary Processes of the Holocene Tidal Flat Complex, Delmarva Peninsula, Virginia,
W73-04360 2L

LOUISIANA STATE UNIV., NEW ORLEANS. DEPT. OF BIOLOGICAL SCIENCES.
Adsorption and Concentration of Dissolved Carbon-14-DDT by Coloring Colloids in Surface Waters,
W73-04012 5B

LUND INST. OF TECH. (SWEDEN). DIV. OF HYDRAULICS.
Hydraulic Roughness of Ice Covers,
W73-04218 2C

MAINZ UNIV. (WEST GERMANY). HYGIENE INSTITUT.
Differences of Bacterial Groups of Nutrient Media in the Determination of Germ Groups in Water (In German),
W73-04257 5A

MANHATTAN COLL., BRONX, N.Y. ENVIRONMENTAL ENGINEERING AND SCIENCE PROGRAM.
Line Source Distributions in Two Dimensions: Applications to Water Quality,
W73-04201 5B

MANITOBA UNIV., WINNIPEG. DEPT. OF SOIL SCIENCE.
Water Absorption by Wheat Seeds as Influenced by Hydraulic Properties of Soil,
W73-04172 3F

MASSACHUSETTS DEPT. OF NATURAL RESOURCES, BOSTON.
A Study of the Marine Resources of Dorchester Bay,
W73-04189 6C

MASSACHUSETTS INST. OF TECH., CAMBRIDGE.
New Sensors for the Automatic Sorting of Municipal Solid Waste,
W73-04279 5D

MASSACHUSETTS UNIV., AMHERST. WATER RESOURCES RESEARCH CENTER.
An Inventory of the Ponds, Lakes and Reservoirs of Massachusetts, Berkshire and Franklin Counties,
W73-04069 2H

MELBOURNE UNIV., PARKVILLE (AUSTRALIA). DEPT. OF CIVIL ENGINEERING.
Lateral Pressures From Soft Clay,
W73-04367 8D

MEMBRIONICS CORP., NEW YORK (ASSIGNEE).
Oil Spillage Control Process,
W73-04129 5G

METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, ILL.
Putting Sewage Solids Back to Work,
W73-04159 5D

MIAMI UNIV., FLA.
Mariculture in Japan Using Heated Effluent Water,
W73-04340 5G

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF CHEMISTRY.
Dried Animal Waste as a Protein Supplement for Sheep,
W73-04449 5E

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF CHEMISTRY.
Influence of Amalgam Formation on Cyclic Voltammetry,
W73-04410 5A

MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF ENTOMOLOGY.
The Uptake of Insecticides by Freshwater Mussels and the Effects of Sublethal Concentrations of Insecticides on These Mussels,
W73-03904 5C

MICHIGAN UNIV., ANN ARBOR.
A Method for Calculating Water Depth, Attenuation Coefficients and Bottom Reflectance Characteristics,
W73-03941 7B

MICHIGAN UNIV., ANN ARBOR. DEPT. OF ENVIRONMENTAL AND INDUSTRIAL HEALTH.
Use of Fallout Cesium-137 as a Tracer to Define the Recent Deltaic Facies of a River,
W73-04501 2J

MICHIGAN UNIV., ANN ARBOR. INST. OF SCIENCE AND TECHNOLOGY.
Lake Ice Surveillance Via Airborne Radar: Some Experimental Results,
W73-03937 7B

MINNESOTA UNIV., MINNEAPOLIS.
Radioactive Wastes,
W73-04239 5B

MINNESOTA UNIV., MINNEAPOLIS. DEPT. OF CIVIL AND MINERAL ENGINEERING; AND MINNESOTA UNIV., MINNEAPOLIS. ST. ANTHONY FALLS HYDRAULIC LAB.
Impact of Cooling Water on Lake Temperatures,
W73-04037 5B

MINNESOTA UNIV., MINNEAPOLIS. ST. ANTHONY FALLS HYDRAULIC LAB.
Flood Forecasting in the Upper Midwest - Data Assembly and Preliminary Analysis,
W73-03906 4A

MINNESOTA UNIV., ST. PAUL. DEPT. OF ENTOMOLOGY, FISHERIES AND WILDLIFE.
Inhibition of Oligomycin-Sensitive and -Insensitive Magnesium Adenosine Triphosphate Activity in Fish by Polychlorinated Biphenyls,
W73-04176 5C

MINNESOTA UNIV., ST. PAUL. WATER RESOURCES RESEARCH CENTER.
A Survey of Attitudes Towards the Mississippi River as a Total Resource in Minnesota,
W73-03905 6B

MISSOURI UNIV., COLUMBIA.
Isotopic Exchange Studies of Micronutrients in Soils,
W73-03963 2G

MISSOURI UNIV., COLUMBIA. DEPT. OF FOOD SCIENCE AND NUTRITION.
Studies on Variants of *Bacillus Stearothermophilus* Strain NCA 1518,
W73-04246 5A

MOBIL OIL CORP., PAULSBORO, N.J. (ASSIGNEE).
Process and System for Control of Fluids in Water Disposal Surge Tanks,
W73-04148 5D

MONSANTO CO., ST. LOUIS, MO.
Quantitative Determination of Nitrilotriacetic Acid and Related Aminopolycarboxylic Acids in Inland Waters: Analysis by Gas Chromatography,
W73-04183 5A

ORGANIZATIONAL INDEX

NEW YORK STATE PUBLIC SERVICE COMMISSION, ALBANY.

MOSCOW STATE UNIV. (USSR).			
Soil Moisture Pressure and Relative Transpiration of Plants in the Case of Soil Drought (In Russian),			
W73-04524	2D		
MOSCOW STATE UNIV. (USSR). KAFEDRA MERZLOTOVEDENIYA.			
Chemical Composition of Atmospheric Precipitation in the Deputatskiy Region (Khimicheskiy sostav atmosfernykh osadkov, vypadayushchikh na territorii Deputatskogo rayona),			
W73-04511	2B		
MOUND LAB., MIAMISBURG, OHIO.			
An Investigation into the Determination of Plutonium in Soil by a Fusion Procedure,			
W73-04295	5B		
NARINO UNIV., PASTO (COLOMBIA).			
INSTITUTO TECHNOLOGICO AGRICOLA.			
Forms of Nitrogen in the Volcanic Soils of Sibundoy (In Spanish),			
W73-04032	5B		
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, Langley Station, VA. Langley Research Center.			
Mixing-Height Measurement by Lidar, Particle Counter, and Rawinsonde in the Willamette Valley, Oregon,			
W73-04102	5B		
NATIONAL BIOLOGICAL STANDARDS LAB., CANBERRA (AUSTRALIA).			
Automatic Sorting of Infrared Spectra,			
W73-04413	7C		
NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C.			
Nuclear Activation Analysis of Se, As, Zn, Cd, and Hg in Environmental Matrices,			
W73-04328	5A		
NATIONAL BUREAU OF STANDARDS, WASHINGTON, D.C., OFFICE OF STANDARD REFERENCE DATA.			
Survey of Analytical Spectral Data Sources and Related Data Compilation Activities,			
W73-04244	5A		
NATIONAL DUST COLLECTOR CORP., SKOKIE, ILL. (ASSIGNEE).			
Method and Apparatus for Removing Sludge from Liquid,			
W73-04142	5D		
NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO.			
Buffalo Lake Recreational Water Quality: A Study in Bacteriological Data Interpretation,			
W73-04162	5B		
NATIONAL ENVIRONMENTAL RESEARCH CENTER, CINCINNATI, OHIO. ANALYTICAL QUALITY CONTROL LAB.			
Inexpensive Mercury-Specific Gas Chromatographic Detector,			
W73-04242	5A		
NATIONAL ENVIRONMENTAL SATELLITE SERVICE, WASHINGTON, D.C.			
An Experimental Model for Automated Detection, Measurement and Quality Control of Sea-Surface Temperatures From ITOS-IR Data,			
W73-03940	7C		
Sea Surface Temperature Mapping off the Eastern United States Using NASA's Itos Satellite,			
W73-03942	7B		
NATIONAL INST. FOR AGRICULTURAL SCIENCES, TOKYO (JAPAN).			
Pesticide Regulations and Residue Problems in Japan,			
W73-04042	5B		
NATIONAL MARINE FISHERIES SERVICE, BEAUFORT, N.C. ATLANTIC ESTUARINE FISHERIES CENTER.			
An Electronic Detector System for Recovering Internally Tagged Menhaden, Genus Brevoortia,			
W73-04174	7B		
NATIONAL MARINE FISHERIES SERVICE, GALVESTON, TEX.			
Hydrographic Survey of the Galveston Bay System, Texas 1963-66,			
W73-04190	2L		
NATIONAL MARINE FISHERIES SERVICE, ST. PETERSBURG BEACH, FLA. GULF COAST FISHERIES CENTER.			
Hydrographic Observations in Tampa Bay, Florida-1969,			
W73-03926	5A		
NATIONAL MARINE FISHERIES SERVICE, TIBURON, CALIF. TIBURON MARINE LAB.			
Measurements of Sea Surface Temperature on the Eastern Pacific Continental Shelf Using Airborne Infrared Radiometry, August 1963 - July 1968,			
W73-04352	7B		
NATIONAL OCEAN SURVEY, DETROIT, MICH. LAKE SURVEY CENTER.			
Transient Analysis of the Detroit River by the Implicit Method,			
W73-04207	2E		
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, OAK RIDGE, TENN. AIR RESOURCES ATMOSPHERIC TURBULENCE AND DIFFUSION LAB.			
Cooling Tower Plume Rise and Condensation,			
W73-04025	5D		
NATIONAL OCEANOGRAPHIC DATA CENTER, ROCKVILLE, MD.			
Literature Search for Atmospheric Humidity Profile Models from the Sea Surface to 1,000 Meters,			
W73-04332	7C		
NATIONAL RESEARCH COUNCIL OF CANADA, OTTAWA (ONTARIO).			
Wave Climate Study: Great Lakes and Gulf of St. Lawrence—Volume II, Appendices A, B, and C,			
W73-04103	2H		
NATIONAL SOIL SERVICES, INC, HOUSTON, TEX.			
Influence of Progressive Failure on Slope Stability,			
W73-04366	8D		
NATIONAL WEATHER SERVICE, SILVER SPRING, MD.			
Use of Surface Observations in Boundary Layer Analysis,			
W73-04333	7C		
NATURE CONSERVANCY, EDINBURGH (SCOTLAND).			
Loch Lomond: Man's Effects on the Salmonid Community,			
W73-04407	5C		
NAVAL POSTGRADUATE SCHOOL, MONTEREY, CALIF.			
Penetration of Free-Falling Objects Into Deep-Sea Sediments,			
W73-04195	2J		
NAVAL RESEARCH LAB., WASHINGTON, D.C.			
The Remote Sensing of Oil Slicks,			
W73-03944	5B		
NEBRASKA UNIV., LINCOLN. DEPT. OF CIVIL ENGINEERING.			
Flexible Pricing in Water Supply Planning—For Flexible Engineers,			
W73-04354	6A		
NEBRASKA UNIV., LINCOLN. DEPT. OF GEOGRAPHY.			
Nebraska Droughts: A Study of their Past Chronological and Spatial Extent with Implications for the Future,			
W73-03907	2B		
NEBRASKA UNIV., LINCOLN. WATER RESOURCES RESEARCH INST.			
National Water Research Opportunities,			
W73-03911	6B		
NEGEV INST. FOR ARID ZONE RESEARCH, BEERSHEBA (ISRAEL).			
Relation Between Energy and Error Due to Nuclear Statistics for Density Measurement by Gamma Ray Transmission,			
W73-03964	8D		
NEW BRUNSWICK UNIV., FREDERICTON.			
Photogrammetry and Hydraulic Surfaces,			
W73-04368	7B		
NEW MEXICO UNIV., ALBUQUERQUE. DEPT. OF ECONOMICS.			
Integration of the Agricultural Demand Function for Water and the Hydrologic Model of the Pecos Basin,			
W73-04277	6D		
NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). DEPT. OF PHYSICAL CHEMISTRY.			
Species Identification in Visible-Ultraviolet Vapor,			
W73-04418	5A		
NEW YORK CITY WATER QUALITY CONTROL OFFICE.			
Trace-Metal Analysis Using Atomic Absorption Spectrophotometry,			
W73-04043	5A		
NEW YORK OPERATIONS OFFICE (AEC), N.Y. HEALTH AND SAFETY LAB.			
Fallout Program. Quarterly Summary Report, June 1, 1972 Through Sept. 1, 1972,			
W73-04315	5B		
Fallout Program Quarterly Summary Report June 1, 1972 - September 1, 1972 - An Appendix,			
W73-04316	5B		
NEW YORK STATE PUBLIC SERVICE COMMISSION, ALBANY.			
Problems and Opportunities in Waste Heat Disposal,			
W73-04347	5G		

ORGANIZATIONAL INDEX

NEWARK COLL. OF ENGINEERING, N.J. DEPT. OF CIVIL

NEWARK COLL. OF ENGINEERING, N.J. DEPT. OF CIVIL AND ENVIRONMENTAL ENGINEERING.	OAK RIDGE NATIONAL LAB., TENN. NUCLEAR SAFETY INFORMATION CENTER. Indexed Bibliography of Thermal Effects Literature - 1, W73-04020	5C	OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL CHEMISTRY. Large, Inexpensive Oven used to Decon- taminant Glassware for Environmental Pest- icide Analysis, W73-04394	5A
Measurement of Suspended Solids Concentra- tions in Sewage by use of a Depolarization Method, W73-04185	Iodine-129 in the Environment Around a Nuclear Fuel Reprocessing Plant, W73-04311	5A	OREGON STATE UNIV., CORVALLIS. DEPT. OF CIVIL ENGINEERING. Finite-Difference Convection Errors, W73-03997	2E
NEWCASTLE-UPON-TYNE UNIV. (ENGLAND). SCHOOL OF MATHEMATICS. Simple Waves on Shear Flows: Similarity Solu- tions, W73-04539	OFFICE OF RADIATION PROGRAMS, WASHINGTON, D.C. FIELD OPERATIONS DIV. Changes of Vascular Aquatic Flowering Plants During 70 Years in Put-In-Bay Harbor, Lake Erie, Ohio, W73-04258	5A	OREGON STATE UNIV., CORVALLIS. DEPT. OF OCEANOGRAPHY. Losses of 65 ZN To Inorganic Surfaces in a Marine Algal Nutrient Medium, W73-04011	5C
NIEDERSAECHSISCHES LANDESAMT FUER BODENFORSCHUNG, HANOVER (WEST GERMANY). Determination of the Moisture Density and the Water Content Variation of a Soil by Measur- ing the Absorption of Gamma Rays, (In Ger- man), W73-04072	OHIO STATE UNIV., COLUMBUS. COLL. OF BIOLOGICAL SCIENCES. The Ohio State University Version of the Stan- ford Streamflow Simulation Model: Part I - Technical Aspects, W73-04542	5C	OREGON STATE UNIV., CORVALLIS. SCHOOL OF OCEANOGRAPHY. Ecological Studies of Radioactivity in the Columbia River Estuary and Adjacent Pacific Ocean, Progress Report, July 1, 1971-June 30, 1972, W73-04299	5B
NORTH CAROLINA WATER RESOURCES RESEARCH INST., RALEIGH. Streamflow Routing (With Applications to North Carolina Rivers), W73-03908	OHIO STATE UNIV., COLUMBUS. DEPT. OF CIVIL ENGINEERING. The Ohio State University Version of the Stan- ford Streamflow Simulation Model: Part II - The Computer Program, W73-04543	2A	OSAKA MUNICIPAL PUBLIC WORK BUREAU (JAPAN). Studies on Purification Theories and Mechanism of Activated Sludge. (III) Similarity in Adsorption Mechanism of Activated Sludge and Charcoal, W73-03993	5D
Regional Development of Public Water Supply Systems, W73-04064	The Ohio State University Version of the Stan- ford Streamflow Simulation Model: Part III - User's Manual, W73-04544	2A	Studies on Purification Theories and Mechanism of Activated Sludge. (IV) Applica- tion of Purification Theories to the Activated Sludge Process, W73-03994	5D
NORTH DAKOTA UNIV., GRAND FORKS. SCHOOL OF MEDICINE. A Shellfish-Borne Cholera Outbreak in Malay- sia, W73-04182	OHIO STATE UNIV., COLUMBUS. WATER RESOURCES CENTER. Electromagnetic Pulse Sounding for Surveying Underground Water, W73-03912	7B	OSLO UNIV. (NORWAY). DEPT. OF LIMNOLOGY. Ice Analyses. Data From Three Norwegian Lakes, W73-04506	2C
NORTHWESTERN UNIV., EVANSTON, ILL. DEPT. OF CIVIL ENGINEERING. Effect of Powdered Activated Carbon on Coagulation with Alum, W73-04165	OKLAHOMA STATE UNIV., STILLWATER. SCHOOL OF CIVIL ENGINEERING. Control of Growth Rate by Initial Substrate Concentration at Values Below Maximum Rate, W73-04499	5C	OTTAWA UNIV., (ONTARIO). DEPT. OF CIVIL ENGINEERING. Amplification Criterion of Gradually Varied, Single Peaked Waves, W73-04097	5B
Reduction of Atmospheric Toluene Diiso- cyanate by Water Vapor, W73-04184	OKLAHOMA WATER RESOURCES RESEARCH INST., STILLWATER. Sensitivity of Groundwater Flow Models to Vertical Variability of Aquifer Constants, W73-04065	2F	OTTAWA UNIV. (ONTARIO). DEPT. OF GEOGRAPHY. The Morphological Effects of Surges of the Donjek Glacier, St Elias Mountains, Yukon Territory, Canada, W73-03934	2C
NORTHWESTERN UNIV., EVANSTON, ILL. DEPT. OF GEOLOGICAL SCIENCES. Strontium-90 in the Great Lakes: Concentra- tion-Time Model, W73-04296	ONTARIO RESEARCH FOUNDATION, TORONTO. Reverse Osmosis for Wastewater Treatment, W73-04487	5D	OUSE AND HULL RIVER AUTHORITY, LEEDS (ENGLAND). Effluent Standards as Proposed by the Royal Commission on Sewage Disposal, W73-04491	5G
OAK RIDGE NATIONAL LAB., TENN. Radioactive Waste Repository Project; Annual Progress Report for Period Ending September 30, 1972, W73-04294	OREGON STATE UNIV., CORVALLIS. Photochemical Degradation of Sediment Or- ganic Matter: Effect on ZN65 Release, W73-04319	5B	PACIFIC GAS AND ELECTRIC CO., EMERYVILLE, CALIF. ENGINEERING RESEARCH DEPT. Marine Life in the Morro Bay Power Plant Discharge Canal, W73-04031	5C
Outcry Over Exposure Guidelines, W73-04314	Seasonal Concentration, Turnover, and Mode of Accumulation of p32 by the Juvenile Starry Flounder in the Columbia River Estuary, Platichthys Stellatus (Pallas), W73-04322	5C	PACIFIC NORTHWEST WATER LAB., CORVALLIS, ORE. Beneficial Uses of Waste Heat - An Evalua- tion, W73-04351	5G
The 1971 Tritium Symposium at Las Vegas, W73-04318	Effects of Elevated Temperature of Juvenile Coho Salmon and Benthic Invertebrates in Model Stream Communities, W73-04545	5C		
Biological Limitations on the Use of Waste Heat in Aquaculture, W73-04342				
Agricultural and Urban Uses of Low-Tempera- ture Heat, W73-04349				
Indexed Bibliography of Thermal Effects Literature - 2, W73-04353				

ORGANIZATIONAL INDEX

RUHRVERBAND, ESSEN (WEST GERMANY).

PALERMO UNIV. (ITALY). ISTITUTO DI APPLICAZIONI E IMPIANTI NUCLEARI.		PRETORIA UNIV. (SOUTH AFRICA). DEPT. OF ZOOLOGY.	RADIATION CENTER OF OSAKA PREFECTURE, OSAKA (JAPAN).
Measurements of Movements of Solid Substances in Water by Means of Stable Tracers and Activation Analysis, W73-04490	5B	Notes on River Habitat Use by the Larger Ungulates in the Kalahari Gemsbok National Park. W73-04273	Observations of Radiouranium and Radiocerium Isotopic Activity Ratios in Rain Water, W73-04313
PALLI SIKSHA SADANA, SRINIKETAN (INDIA). DEPT. OF CHEMISTRY.		PROCTER AND GAMBLE CO., CINCINNATI, OHIO. MIAMI VALLEY LABS.	5A
Combined Ion Exchange-Solvent Extraction (Ciese) Studies of Metal Ions on Ion Exchange Papers, W73-04414	5A	Raman Spectra-Structure Correlation for Pyrazines. New Method for Obtaining Spectra of Trapped Nanoliter Gas Chromatograph Fractions, W73-04368	RAYTHEON CO., ALEXANDRIA, VA. EQUIPMENT DIV.
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. SOURCES OF WATER POLLUTION ESTABLISHED BY USING A NEUTRON ACTIVATABLE TRACER, W73-04326	5B	PUERTO RICO NUCLEAR CENTER.	Remote Sensing of the Arctic Ice Environment, W73-03938
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF CHEMISTRY.		MAYAGUEZ.	7B
Perchlorate Determination by Thermometric Enthalpy Titration, W73-04230	5A	Stable Element Concentrations and Estimations of the Radionuclide Contents in the Fish and Invertebrates Sampled from the Waters Adjacent to Panama and Columbia, W73-04307	RAYTHEON CO., WAYLAND, MASS.
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF GEOCHEMISTRY AND MINERALOGY.		Characterization of the Sediments from the Tura and Sabana River Estuaries, W73-04306	Energy Spectra of Sea Waves from Photographic Interpretation, W73-03939
The Chemical History of Some Spring Waters in Carbonate Rocks, W73-03959	5B	PUERTO RICO UNIV., MAYAGUEZ. DEPT. OF MARINE SCIENCES.	7B
PENNSYLVANIA STATE UNIV., UNIVERSITY PARK. DEPT. OF NUCLEAR ENGINEERING.		Notes on A Mangrove Lagoon and Mangrove Channels at La Parguera, Puerto Rico, W73-04241	RENDELL, PALMER AND TRITTON, LONDON (ENGLAND).
The Dose to Man from Atmospheric KR-85, W73-04291	5B	PURDUE UNIV., LAFAYETTE, IND. DEPT. OF CHEMISTRY.	Computer Model of Vortex Shedding from a Cylinder, W73-04216
PENNSYLVANIA TRANSPORTATION AND TRAFFIC SAFETY CENTER, UNIVERSITY PARK.		Miniature On-Line Digital Computer for Multipurpose Applications. Applications to Kinetic Analyses, W73-04387	8B
Planning for Coastal Ports on a Systems Basis: Preliminary Methodological Design, W73-04525	8A	Some Comments on the Signal-to-Noise Characteristics of Real Photomultiplier and Photodiode Detection Systems, W73-04419	RENDEL, PALMER AND TRITTON, LONDON (ENGLAND).
PENNWALT CORP., PHILADELPHIA, PA. (ASSIGNEE).		PURDUE UNIV., LAFAYETTE, IND. WATER RESOURCES RESEARCH CENTER.	A Technique for the Comparison of Contact and Non-Contact Measurements of Water Surface Temperature, W73-03948
Liquid and Sludge Treatment, W73-04143	5D	Stochastic Analysis of Monthly Flow Data Application to Lower Ohio River Tributaries, W73-04063	RESEARCH INST. FOR ANIMAL NUTRITION, POHORELICE (CZECHOSLOVAKIA).
PERUGIA UNIV. (ITALY).		PURDUE UNIV., LAFAYETTE, IND. DEPT. OF BIOCHEMISTRY.	Fluoro-Ion Activity Electrode as a Suitable Means for Exact Direct Determination of Urinary Fluoride, W73-04415
The Polluted Waters in Umbria: III. The River Nestore, (In Italian), W73-04393	5B	Analysis for Crude Fatty Acids (Total Fatty Acids and Unsaponifiable Matter) in Feed Grade Fats: Report of the Joint AOAC-AOCS Committee on the Analysis of Feed Grade Fats, W73-04397	5A
PETROZAVODSK STATE UNIV. (USSR).		PUSAN FISHERIES COLL. (KOREA).	RESOURCES CONSERVATION CO., EL PASO, TEX.
Consumption of Oligochaete Worms by Fish and Invertebrates, (In Russian), W73-04520	21	Propagation of Grass Carp and Silver Carp, (In Korean), W73-04261	Reclaiming Cooling Tower Blowdown, W73-04040
PHILADELPHIA WATER DEPT., PA.		QUEEN'S UNIV., KINGSTON (ONTARIO). DEPT. OF GEOGRAPHY.	5D
Control of the Anaerobic Digestion Process and Supporting Unit Processes, W73-04430	5D	The Clay Mineralogy and Some Properties of Bottom Sediments of the St. Lawrence River Near Kingston, Ontario, W73-04538	RHOH ISLAND UNIV., KINGSTON.
PITTSBURGH UNIV., PA. DEPT. OF MICROBIOLOGY AND EPIDEMIOLOGY.		QUESTIONICS, LOS ANGELES, CALIF.	GRADUATE SCHOOL OF OCEANOGRAPHY.
Improved Procedure for Identification of Group D Enterococci with Two New Media, W73-04253	5A	Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	Bacterial Reduction of Arsenate in Sea Water, W73-04479
POLLUTION CONTROL PRODUCTS, INC., PORTLAND, MAINE (ASSIGNEE).		QUESTIONICS, LOS ANGELES, CALIF.	5B
Batch Sewage Treatment System, W73-04136	5D	Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	RIJKSINSTITUUT VOOR DE VOLKSGEZONDHEID, UTRECHT, (NETHERLANDS).
POLYMETRICS, INC., SAN CARLOS, CALIF. (ASSIGNEE).		QUEEN'S UNIV., KINGSTON (ONTARIO). DEPT. OF GEOGRAPHY.	Mercury in Fish - Total Content in Freshwater and Marine Fishes (VII. (Totaal) Kwikgehalte van Zoetwateren Zeevis), W73-04044
Reverse Osmosis Water Purifier, W73-04135	3A	The Clay Mineralogy and Some Properties of Bottom Sediments of the St. Lawrence River Near Kingston, Ontario, W73-04538	5C
		QUESTIONICS, LOS ANGELES, CALIF.	ROCHESTER INST. OF TECH., N.Y.
		Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	Use of Potassium Phthalimide for Identification of Alkylenic Bis Halides and Bis Sulfonates, W73-04416
		QUESTIONICS, LOS ANGELES, CALIF.	5A
		Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	ROHM AND HAAS CO., PHILADELPHIA, PA. RESEARCH LABS.
		QUESTIONICS, LOS ANGELES, CALIF.	Ion Exchange for the Metal Products Finisher-Part I, W73-04497
		Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	5D
		QUESTIONICS, LOS ANGELES, CALIF.	ROME UNIV. (ITALY). INSTITUTE DI ZOOLOGIA.
		Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	A New Species of Parastenocaris (Crustacea, Copepoda) of the Hyporeic Ground Water of the Liscia River (Sardinia), (In Italian), W73-04378
		QUESTIONICS, LOS ANGELES, CALIF.	5C
		Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	ROORKE UNIV., (INDIA).
		QUESTIONICS, LOS ANGELES, CALIF.	Behavior of Koyna Dam-Dec. 11, 1967 Earthquake, W73-04076
		Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	8E
		QUESTIONICS, LOS ANGELES, CALIF.	RUHRVERBAND, ESSEN (WEST GERMANY).
		Cooling Water Scale Control: The Scale Meter and the Critical pH of Scaling, W73-04003	Sludge Dewatering Tests with a Belt Press, W73-04432
		QUESTIONICS, LOS ANGELES, CALIF.	5D

ORGANIZATIONAL INDEX

SACRAMENTO STATE COLL., CALIF.

SACRAMENTO STATE COLL., CALIF.
Clean Water and Power,
W73-04436 5G

SALFORD UNIV. (ENGLAND). DEPT. OF CHEMISTRY.
The Optimum Flocculant Concentration for Effective Flocculation of China Clay in Aqueous Suspension,
W73-04477 SD

SAN DIEGO COUNTY DEPT. OF PUBLIC HEALTH, CALIF.
Concentration of Reovirus and Adenovirus From Sewage and Effluents by Protamine Sulfate (Salmine) Treatment,
W73-03995 SD

SARGENT AND LUNDY, CHICAGO, ILL.
Statistical Properties of Missouri River Bed Forms,
W73-04365 8B

SEVERO-VOSTOCHNYI KOMPLEKSY NAUCHNO-ISSLEDOVATELSKII INSTITUT, MAGADAN (USSR).
Paleomagnetic Studies of Bottom Sediments from the Indian Ocean Area of the Antarctic (Paleomagnitnye issledovaniya donyakh otlozhenny Indiyskogo sektora Antarktiki),
W73-04516 23

SOCIETÀ ANONIMA ELETTRIFICAZIONE S.P.A., MILAN, (ITALY).
New Structural Designs for H. V. Transmission Towers,
W73-04078 8C

SOIL CONSERVATION SERVICE, ANN ARBOR, MICH.
Urban Erosion—Practical Alternatives,
W73-04359 4D

SOIL CONSERVATION SERVICE, RALEIGH, N.C.
Iron and Silica in Water, Acid Ammonium Oxalate, and Dithionite Extracts of Some North Carolina Coastal Plain Soils,
W73-04088 2G

SOIL CONSERVATION SERVICE, WASHINGTON, D.C.
East Fork of Whitewater River, Indiana and Ohio (Final Environmental Impact Statement),
W73-04458 8A

SOUTH DAKOTA STATE UNIV., BROOKINGS. WATER RESOURCES INST.
Ecological Factors Influencing Production of Algae in Northern Prairie Lakes,
W73-03909 5C

SOUTH DAKOTA STATE UNIV., BROOKINGS. WATER RESOURCES RESEARCH INST.
Studies of the Influence of Lagoons and Landfills on Groundwater Quality,
W73-04066 5B

SOUTH OF SCOTLAND ELECTRICITY BOARD, GLASGOW; AND CENTRAL ELECTRICITY GENERATING BOARD, LONDON (ENGLAND).
Environmental Aspects of High Voltage Substations,
W73-04080 8C

SOUTHERN ILLINOIS UNIV., CARBONDALE. DEPT. OF GEOLOGY.
Overbank Sedimentation in the Delaware River Valley During the Last 6000 Years,
W73-04194 2J

SOUTHWEST TEXAS STATE UNIV., SAN MARCOS. AQUATIC STATION.
The Physicochemical Limnology of a Stretch of the Guadalupe River, Texas, With Five Main-Stream Impoundments,
W73-04505 2H

SOUTHWEST TEXAS STATE UNIV., SAN MARCOS. DEPT. OF BIOLOGY.
Nitrogen and Phosphorus Dynamics in Three Central Texas Impoundments,
W73-04484 5C

SPECTRAN, INC., LOS ANGELES, CALIF.
Multi-Sensor Oil Spill Detection,
W73-03946 5B

SPILEDEVANDSUDVALGET, SOBORG (DENMARK).
'Sun-Shade' Adaptation in Microbenthic Algae from the Oresund,
W73-04519 5C

STAATSSINSTITUT FUER ANGEWANDTE BOTANIK, HAMBURG UNIV. (WEST GERMANY).

Investigations on the Water Uptake of Cracking and Noncracking Cotyledons of Bean Seeds (*Phaseolus vulgaris* L.) (In German),
W73-04301 3F

STATE UNIV. OF NEW YORK, BUFFALO.
Estimating Discharge from Superelevation in Bends,
W73-04219 8B

STEIN (RICHARD G.) AND ASSOCIATES, NEW YORK.
A Matter of Design,
W73-04030 6C

STOCKHOLM UNIV. (SWEDEN). ASKO LAB.
Studies on Chemical, Physical and Biological Conditions in Swedish Rockpool Ecosystems,
W73-04191 2H

STOCKHOLM UNIV. (SWEDEN). DEPT. OF BIOCHEMISTRY.
Birds Give Warning,
W73-04049 5C

Methylmercury, A Review of Health Hazards and Side Effects Associated with the Emission of Mercury into Natural Systems,
W73-04127 5C

STOCKHOLM UNIV. (SWEDEN).
INSTITUTIONEN FOR ANALYTISK KEMI.
Sources of Error and Confirmation in the Determination of Methylmercury Radicals,
W73-04050 5A

SYDNEY UNIV. (AUSTRALIA). DEPT. OF GEOGRAPHY.
A Comparison of Morphometric Measures of Bankfull,
W73-04375 2E

TECHNICAL UNIV. OF DENMARK, COPENHAGEN. SANITARY ENGINEERING LAB.
Relative Diffusion in Nonisotropic Turbulence,
W73-04212 5B

TECHNICAL UNIV. OF PRAGUE (CZECHOSLOVAKIA). DEPT. OF NUCLEAR CHEMISTRY.
On the State of Mercury (II) Traces in Aqueous Solutions - Colloidal Behavior of Mercury,
W73-04126 5A

TECHNISCHE HOCHSCHULE, VIENNA (AUSTRIA). INSTITUT FUER GEOPHYSIK.
A Model of a Surging Glacier,
W73-03933 2C

TELEDYNE ISOTOPES, LAS VEGAS, NEV.
Determination of a Coefficient of Dispersion Under Field Conditions: Interim Report,
W73-04290 5B
TEXAS A AND M UNIV., COLLEGE STATION.
Trickle Irrigation System Design,
W73-04082 3F

TEXAS A AND M UNIV., WESLACO. AGRICULTURAL RESEARCH AND EXTENSION CENTER.
Trickle Irrigation...A More Efficient Means of Water Management,
W73-03953 3C

TEXAS LAW INST. OF COASTAL AND MARINE RESOURCES, HOUSTON.
Texas Seashore Boundary Law: The Effect of Natural and Artificial Modifications,
W73-04460 6E

TEXAS UNIV., AUSTIN. CENTER FOR RESEARCH IN WATER RESOURCES.
Before and After Studies on the Effects of a Power Plant Installation on Lake LBJ - a Numerical Temperature Model for Lake LBJ,
W73-04335 5B

Before and After Studies of the Effects of a Power Plant Installation on Lake LBJ - Measurement and Prediction of Abnormal Reservoir Operations on Lake LBJ's Water Quality,
W73-04336 5B

THOMAS J. WATSON RESEARCH CENTER, YORKTOWN HEIGHTS, N.Y.
Quantitative Characterization of Channel Network Structure,
W73-04204 8B

TIPPETTS-ABBETT-MCCARTHY-STRATTON, NEW YORK.
Earth and Earth-Rock Dams,
W73-04074 8D

TOKYO UNIV. (JAPAN). FACULTY OF ENGINEERING.
Reduction of Chromate by Zinc at Constant pH's. Chemistry of Chromate Treatment (Part 2) (In Japanese),
W73-04282 5D

TUNNEL. (K. W.), CO., PHILADELPHIA, PA.
Preventive Maintenance and Operational Know-How Improve Waste Treatment Systems,
W73-04278 5D

UKRAINSKI NAUCHNO-ISSLEDOVATELSKII GIDROMETEOROLOGICHESKII INSTITUT, KIEV (USSR).
Investigation and Calculation of Components in the Hydrologic Regime of Rivers (Issledovaniya i raschety elementov gidrologicheskogo rezhima rek).
W73-04111 2E

Historic Flood on the Tisza River, May 12-18, 1970 (Vydavushchiya dozhdovoy pavidok na r. Tise 12-18 maya 1970 g.),
W73-04112 2E

Effect of Karst on Floods on Left-Bank Tributaries of the Dniester River (Vliyanie karsta

ORGANIZATIONAL INDEX

WATERLOO UNIV. (ONTARIO). DEPT. OF CHEMISTRY.

na formirovaniye livnevyykh pavodkov na levoberezhnykh pritokakh Dnistra), W73-04114	2E	UNIVERSITY OF SOUTHERN MISSISSIPPI, HATTIESBURG. DEPT. OF CHEMISTRY. Reduction of Aromatic Fluorine Compounds, W73-04412	5B	WASHINGTON STATE UNIV., PULLMAN. DEPT. OF CIVIL ENGINEERING. Bioconcentration of Arsenic by Activated Sludge Biomass, W73-04124	5D
Calculations of Maximum Flood Discharges on Mountain Streams in the Crimea (Raschetny maksimal'nykh raskhodov vody dozhdovykh pavodkov na gornykh rekakh Kryma), W73-04115	2E	UNIVERSITY OF WESTERN ONTARIO, LONDON. DEPT. OF BIOENGINEERING. Flocculant Production from Kerosene, W73-04245	5B	WASHINGTON STATE WATER RESEARCH CENTER, PULLMAN. A Dynamic Programming Study of Various Diversion Losses, W73-04068	4A
Spring-Flood Runoff From Small Watercourses in the Ukraine and Moldavia (Ob'yemy stoka vesennego polovod'ya malykh vodotokov Ukrainy i Moldavii), W73-04116	2E	UNIVERSITY OF WESTERN ONTARIO, LONDON. DEPT. OF GEOGRAPHY. Stability and the Conservation of Mass in Drainage Basin Evolution, W73-04202	2A	WASHINGTON UNIV., SEATTLE. Effects on Freshwater Fish, W73-04236	5C
Effect of Underlying Formations on Annual Runoff in Lowlands of the Dniester River Basin (Vliyanie na godovoy stok osobennostey podstilyushchey poverkhnostiv ravninnoy chasti basseyna Dnesta), W73-04117	2E	UPPSALA UNIV., (SWEDEN). INST. OF PHYSIOLOGICAL BOTANY. Algal Assay Procedure, W73-04404	5A	WASHINGTON UNIV., SEATTLE. DEPT. OF CHEMISTRY. Radiocarbon in the Sea, W73-04292	5B
Minimum Streamflow in Northwest Ukraine (Osobennosti formirovaniya minimal'nogo stoka rek Severo-Zapada Ukrayiny), W73-04118	2E	UTAH STATE UNIV., LOGAN. DEPT. OF SOIL SCIENCE AND BIOMETEOROLOGY. Influence of Water Content on Electrical Con- ductivity of the Soil, W73-04093	2G	WASHINGTON UNIV., SEATTLE. DEPT. OF MECROBIOLOGY. Incidence of Prosthecate Bacteria in a Polluted Stream, W73-04265	5B
Particle Size of Mudflows on Carpathian Rivers in the Ukraine (Granulometricheskiy sostav selevykh otlozhennyi na rekakh Ukrainskikh Karpat), W73-04119	2E	UTAH UNIV., SALT LAKE CITY. DEPT. OF CIVIL ENGINEERING. Coastal Currents of Pacific Northwest, W73-04364	5B	WASHINGTON UNIV., SEATTLE. DEPT. OF OCEANOGRAPHY. Analysis of Turbidite Correlation in Cascadia Basin, Northeast Pacific Ocean, W73-04249	5B
Hydrologic Studies in Northern Algeria (O gidrologicheskoi i zuchennosti territorii Sever- nogo Alzhira), W73-04120	2E	VANDERBILT UNIV., NASHVILLE, TENN. DEPT. OF ENVIRONMENTAL AND WATER RESOURCES ENGINEERING. Predicting Effects of Dead Zones on Stream Mixing, W73-04288	5B	WASHINGTON UNIV., SEATTLE. LAB OF RADIATION ECOLOGY. Studies of the Natural Alpha-Emitting Radiosotopes in Marine Organisms, W73-04320	5B
UKRAINSKII NAUCHNO-ISSLEDOVATELSKII GIDROMETEOROLOGICHESKII INSTITUT, KIEV (USSR).		VERMONT UNIV., BURLINGTON. TECHNICAL INFORMATION CENTER. Control of Copper Electroplating Wastes: An Annotated Bibliography, W73-04467	5G	WASHINGTON UNIV., ST. LOUIS, MO. SCHOOL OF MEDICINE. Legacy of the Mad Hatter, W73-04048	5C
Investigation of Storm Runoff on Small Watersheds in Lowlands of the Ukraine (Iss- ledovaniye poter' dozhdevogo stoka na malykh vodoborony ravninnoy territorii Ukrayiny), W73-04113	2E	VICTORIA UNIV. (BRITISH COLUMBIA). A Method of Collecting Periphyton in Lentic Habitats with Procedures for Subsequent Sam- ple Preparation and Quantitative Assessment, W73-04270	2L	WATER POLLUTION RESEARCH LAB., STEVENAGE (ENGLAND). 3-Propyl-5-Hydroxy-5-D-Arabinotetrahydrox- butyl-3-Thiazolidine-2-Thione, A Specific Colorimetric Reagent for the Determination of Copper in Water, W73-04056	5A
UNITED STATES PHILIPS CORP. Backflushing Filter, W73-04151	5D	VIRGINIA INST. OF MARINE SCIENCE, GLOUCESTER POINT. Oil Slick Studies Using Photographic and Multi- spectral Scanner Data, W73-03945	5B	Separation of Activated Sludge from Mixed Liquor Using a Continuous Centrifuge, W73-04431	5D
UNIVERSITE FEDERALE DU CAMEROUN, YAOUNDE. LAB. OF HYDRAULICS AND FLUID MECHANICS.		VIRGINIA POLYTECHNIC INST. AND STATE UNIV., BLACKSBURG. Stream Faunal Recovery After Manganese Strip Mine Reclamation, W73-04546	5C	An Evaluation of Procedures for Enumerating Bacteria in Activated Sludge, W73-04450	5A
Calculation of Discharge from Partially Penetrating Wells in Water Table Aquifers in Isotropic and Anisotropic Soils (Determinacion du debit des puits incomplets de nappes libres foncés en terrain isotrope et anisotrope), W73-04382	4B	VIRGINIA POLYTECHNIC INST., BLACKSBURG. CENTER FOR ENVIRONMENTAL STUDIES. Coping with Heated Waste Water Discharges from Steam-Electric Power Plants, W73-04026	5C	Effluent Standards and the Assessment of the Effects of Pollution on Rivers, W73-04494	5G
UNIVERSITY COLL. OF SOUTH WALES AND MONMOUTHSHIRE, CARDIFF. DEPT. OF MICROBIOLOGY.		VITRO CORP. OF AMERICA, PORTLAND, OREGON. The Thermal-Water Horticultural Demonstration Project at Springfield, Oregon, W73-04343	5G	WATER RESEARCH ASSOCIATION, MARLOW (ENGLAND). Some Single- and Multi-Site Models of Rainfall Within Discrete Time Increments, W73-04372	2B
Microbes as Tracers of Water Movement, W73-04392	5B	VOLCANI INST. OF AGRICULTURAL RESEARCH, REHOVOTH (ISRAEL). Steady-State Evaporation Through Non- Homogeneous Soils From a Shallow Water Ta- ble, W73-04110	2D	WATER RESOURCES COUNCIL, WASHINGTON, D.C. Genesee River Basin, New York and Pennsylvania (Final Environmental Impact Statement), W73-04475	8A
UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. DEPT. OF CIVIL ENGINEERING. Nonuniform Groundwater-Conduit Discharge and Head Loss, W73-04362	2F			WATERLOO UNIV. (ONTARIO). DEPT. OF CHEMISTRY. Computer-Aided Visual Spectrum Analysis, W73-04234	5A
UNIVERSITY OF SOUTHERN CALIFORNIA, LOS ANGELES. SEA GRANT PROGRAM. Marina Del Rey: A Study of Environmental Variables in a Semi-Enclosed Coastal Water, W73-04197	5B				

ORGANIZATIONAL INDEX

WEST HERTFORDSHIRE MAIN DRAINAGE AUTHORITY,

WEST HERTFORDSHIRE MAIN DRAINAGE AUTHORITY, RICKMANSWORTH (ENGLAND).
Higher Standards: The Local Authorities View, W73-04492

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.
Red Sea Drillings, W73-04193

2J

WESTERN KRAFT CORP., HAWESVILLE, KY.
In-line Strong Black Liquor Oxidizers, A Non-Conventional Secondary Oxidation Treatment, W73-04161

Shallow-Water Strontium-90 Anomaly About the Antilles Arc-1970, W73-04293

5B

WESTERN REGIONAL RESEARCH LAB., ALBANY, CALIF.
Recondition Brine to Cut Pollution, W73-04160

5D

WESTERN REGIONAL RESEARCH LAB., BERKELEY, CALIF.
Reduces Effluent from Blanching, W73-04163

5D

WESTINGHOUSE ELECTRIC CORP., PITTSBURGH, PA.
Combination Urban-Power Systems Utilizing Waste Heat, W73-04350

5G

WESTON (ROY F.), INC., WEST CHESTER, PA.
Handling and Disposal of Chemical Wastes, W73-04008

5D

WEYERHAEUSER CO., TACOMA, WASH.
What is Expected in In-Plant Control and Waste Treatment in the Future, W73-04437

5D

WHITE FISH AUTHORITY, LONDON (ENGLAND).

Development of Systems in Marine Fish Cultivation in the United Kingdom, W73-04339

5G

WISCONSIN UNIV., GREEN BAY, COLL. OF ENVIRONMENTAL SCIENCES.

Wind-Induced and Thermally Induced Currents in the Great Lakes, W73-04208

2H

WISCONSIN UNIV., MADISON.

Remote Sensing Considerations for Water Quality Monitoring, W73-03947

5B

Measurement of Unsaturated Conductivity and Diffusivity by Infiltration Through an Impeding Layer, W73-03971

2G

WISCONSIN UNIV., MADISON, DEPT. OF ENTOMOLOGY.

Effects of Various Soil Fungi and Insecticides on the Capacity of *Mucor alternans* to Degrade DDT, W73-04232

5B

WISCONSIN UNIV., MADISON, DEPT. OF SOIL SCIENCE.

Stomatal Conductance of Differentially Salinized Plants, W73-04181

3C

WISCONSIN UNIV., MILWAUKEE, CENTER FOR GREAT LAKES STUDIES.

The Eutrophication Problem, W73-04403

5C

WOODS HOLE OCEANOGRAPHIC INSTITUTION, MASS.

Cooling Water Chlorination and Productivity of Entrained Phytoplankton, W73-04427

5F

W73-04135	3A
W73-04136	SD
W73-04137	SD
W73-04138	SD
W73-04139	SD
W73-04140	3A
W73-04141	SD
W73-04142	SD
W73-04143	SD
W73-04144	SD
W73-04145	3A
W73-04146	SD
W73-04147	5A
W73-04148	SD
W73-04149	3B
W73-04150	SD
W73-04151	SD
W73-04152	SD
W73-04153	8A
W73-04154	SG
W73-04155	SD
W73-04156	SD
W73-04157	SG
W73-04158	SD
W73-04159	SD
W73-04160	SD
W73-04161	SD
W73-04162	SB
W73-04163	SD
W73-04164	2G
W73-04165	SD
W73-04166	SD
W73-04167	5G
W73-04168	SG
W73-04169	4A
W73-04170	5F
W73-04171	3F
W73-04172	3F
W73-04173	3F
W73-04174	7B
W73-04175	3F
W73-04176	5C
W73-04177	2I
W73-04178	5G
W73-04179	2J
W73-04180	2G
W73-04181	3C
W73-04182	5C
W73-04183	5A
W73-04184	5B
W73-04185	5A
W73-04186	5B
W73-04187	SD
W73-04188	SD
W73-04189	6C
W73-04190	2L
W73-04191	2H
W73-04192	7C
W73-04193	2J
W73-04194	2J
W73-04195	2J
W73-04196	8B
W73-04197	5B
W73-04198	4A
W73-04199	4A
W73-04200	5B
W73-04201	5B
W73-04202	2A
W73-04203	4A
W73-04204	8B
W73-04205	2J
W73-04206	2E
W73-04207	2E
W73-04208	2H
W73-04209	2E
W73-04210	2E
W73-04211	7C
W73-04212	5B

ACCESSION NUMBER INDEX

W73-04213

W73-04213	8B	W73-04292	5B	W73-04371	2A	W73-04450	5A
W73-04214	5B	W73-04293	5B	W73-04372	2B	W73-04451	5D
W73-04215	8B	W73-04294	5B	W73-04373	2F	W73-04452	6E
W73-04216	8B	W73-04295	5B	W73-04374	2F	W73-04453	6E
W73-04217	8B	W73-04296	5A	W73-04375	2E	W73-04454	6E
W73-04218	2C	W73-04297	5B	W73-04376	2G	W73-04455	8A
W73-04219	8B	W73-04298	5B	W73-04377	8C	W73-04456	6E
W73-04220	2E	W73-04299	5B	W73-04378	5C	W73-04457	8D
W73-04221	4A	W73-04300	5C	W73-04379	4B	W73-04458	8A
W73-04222	5B	W73-04301	3F	W73-04380	2E	W73-04459	6E
W73-04223	8B	W73-04302	5B	W73-04381	2E	W73-04460	6E
W73-04224	3F	W73-04303	5A	W73-04382	4B	W73-04461	5G
W73-04225	2G	W73-04304	5A	W73-04383	7C	W73-04462	5B
W73-04226	2L	W73-04305	5B	W73-04384	8B	W73-04463	6G
W73-04227	7C	W73-04306	5A	W73-04385	7C	W73-04464	6E
W73-04228	8B	W73-04307	5C	W73-04386	7C	W73-04465	6C
W73-04229	2L	W73-04308	5C	W73-04387	7C	W73-04466	5G
W73-04230	5A	W73-04309	8I	W73-04388	5A	W73-04467	5G
W73-04231	5A	W73-04310	5A	W73-04389	5A	W73-04468	5G
W73-04232	5B	W73-04311	5A	W73-04390	5F	W73-04469	5G
W73-04233	5C	W73-04312	5D	W73-04391	5A	W73-04470	6E
W73-04234	5C	W73-04313	5A	W73-04392	5B	W73-04471	6E
W73-04235	5B	W73-04314	5G	W73-04393	5B	W73-04472	6E
W73-04236	5C	W73-04315	5B	W73-04394	5A	W73-04473	6E
W73-04237	5A	W73-04316	5B	W73-04395	5C	W73-04474	5G
W73-04238	5C	W73-04317	5C	W73-04396	5D	W73-04475	8A
W73-04239	5B	W73-04318	5A	W73-04397	5A	W73-04476	5D
W73-04240	5C	W73-04319	5B	W73-04398	5A	W73-04477	5D
W73-04241	5C	W73-04320	5B	W73-04399	5C	W73-04478	5D
W73-04242	5A	W73-04321	5C	W73-04400	5B	W73-04479	5B
W73-04243	5C	W73-04322	5C	W73-04401	5C	W73-04480	5D
W73-04244	5A	W73-04323	5A	W73-04402	5B	W73-04481	5G
W73-04245	5B	W73-04324	5A	W73-04403	5C	W73-04482	5G
W73-04246	5A	W73-04325	5B	W73-04404	5A	W73-04483	5G
W73-04247	5A	W73-04326	5B	W73-04405	5C	W73-04484	5C
W73-04248	5A	W73-04327	5A	W73-04406	5C	W73-04485	2I
W73-04249	5B	W73-04328	5A	W73-04407	5C	W73-04486	5D
W73-04250	5B	W73-04329	5A	W73-04408	5A	W73-04487	5D
W73-04251	5A	W73-04330	5C	W73-04409	5A	W73-04488	5D
W73-04252	7B	W73-04331	5C	W73-04410	5A	W73-04489	5C
W73-04253	5A	W73-04332	7C	W73-04411	5D	W73-04490	5B
W73-04254	7B	W73-04333	7C	W73-04412	5B	W73-04491	5G
W73-04255	2G	W73-04334	7B	W73-04413	7C	W73-04492	5F
W73-04256	2D	W73-04335	5B	W73-04414	5A	W73-04493	5G
W73-04257	5A	W73-04336	5B	W73-04415	5A	W73-04494	5G
W73-04258	5C	W73-04337	5G	W73-04416	5A	W73-04495	5C
W73-04259	2C	W73-04338	5G	W73-04417	5A	W73-04496	5D
W73-04260	3F	W73-04339	5G	W73-04418	5A	W73-04497	5D
W73-04261	8I	W73-04340	5G	W73-04419	7B	W73-04498	5D
W73-04262	5C	W73-04341	5G	W73-04420	7B	W73-04499	5C
W73-04263	2I	W73-04342	5G	W73-04421	5D	W73-04500	5C
W73-04264	2I	W73-04343	5G	W73-04422	5D	W73-04501	2J
W73-04265	5B	W73-04344	2I	W73-04423	5A	W73-04502	4B
W73-04266	3E	W73-04345	5G	W73-04424	5D	W73-04503	4B
W73-04267	3F	W73-04346	5G	W73-04425	5D	W73-04504	4B
W73-04268	3F	W73-04347	5G	W73-04426	5A	W73-04505	2H
W73-04269	2G	W73-04348	5G	W73-04427	5F	W73-04506	2C
W73-04270	2L	W73-04349	5G	W73-04428	5G	W73-04507	2J
W73-04271	2I	W73-04350	5G	W73-04429	5G	W73-04508	8B
W73-04272	5C	W73-04351	5G	W73-04430	5D	W73-04509	2C
W73-04273	2I	W73-04352	7B	W73-04431	5D	W73-04510	2C
W73-04274	6B	W73-04353	5C	W73-04432	5D	W73-04511	2B
W73-04275	6A	W73-04354	6A	W73-04433	5D	W73-04512	2J
W73-04276	4A	W73-04355	4C	W73-04434	5G	W73-04513	2C
W73-04277	6D	W73-04356	4C	W73-04435	5D	W73-04514	2J
W73-04278	5D	W73-04357	4C	W73-04436	5G	W73-04515	2E
W73-04279	5D	W73-04358	2J	W73-04437	5D	W73-04516	2J
W73-04280	5D	W73-04359	4D	W73-04438	5D	W73-04517	2J
W73-04281	2G	W73-04360	2L	W73-04439	5D	W73-04518	2C
W73-04282	5D	W73-04361	2J	W73-04440	5C	W73-04519	5C
W73-04283	5D	W73-04362	2F	W73-04441	5D	W73-04520	2I
W73-04284	5D	W73-04363	4B	W73-04442	5C	W73-04521	5G
W73-04285	5F	W73-04364	5B	W73-04443	5D	W73-04522	2I
W73-04286	5D	W73-04365	8B	W73-04444	8G	W73-04523	6G
W73-04287	5D	W73-04366	8D	W73-04445	5D	W73-04524	2D
W73-04288	5B	W73-04367	8D	W73-04446	5D	W73-04525	8A
W73-04289	5D	W73-04368	7B	W73-04447	5D	W73-04526	2J
W73-04290	5B	W73-04369	4B	W73-04448	5D	W73-04527	2F
W73-04291	5B	W73-04370	4B	W73-04449	5E	W73-04528	2A

ACCESSION NUMBER INDEX

W73-04550

W73-04529 2K

W73-04530 2A

W73-04531 7C

W73-04532 2B

W73-04533 3B

W73-04534 2F

W73-04535 2E

W73-04536 5E

W73-04537 7C

W73-04538 2J

W73-04539 2E

W73-04540 2E

W73-04541 5B

W73-04542 2A

W73-04543 2A

W73-04544 2A

W73-04545 5C

W73-04546 5C

W73-04547 5D

W73-04548 2H

W73-04549 5D

W73-04550 5D

Outline of Classification

ABC-045: Major General Cataloguing, Research
Activities and Studies, JAlameda Research Institute, Institute for Defense
and Strategic Identification of Polygraphs

Bureau of Bibliographical Engineering Press

Calgary University Hispanic Series
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Reference Section

University of Florida, Electronic Commerce System

University of Idaho, Regional Computer and
Management

U. S. Geological Survey, Mineral

University of Wisconsin, World Population

University of Wyoming, External Relations

Abstract Sources

Abstract Number

Type of

W73-04500 - 01000

04502 - 01000

04510 - 01000

04520 - 01000

04500000 - 04500

04500001 - 04500

04500002 - 04500

04500003 - 04500

04500004 - 04500

04500005 - 04500

04500006 - 04500

04500007 - 04500

04500008 - 04500

04500009 - 04500

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Type of

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04500000 - 04500

04500001 - 04500

04500002 - 04500

04500003 - 04500

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04500005 - 04500

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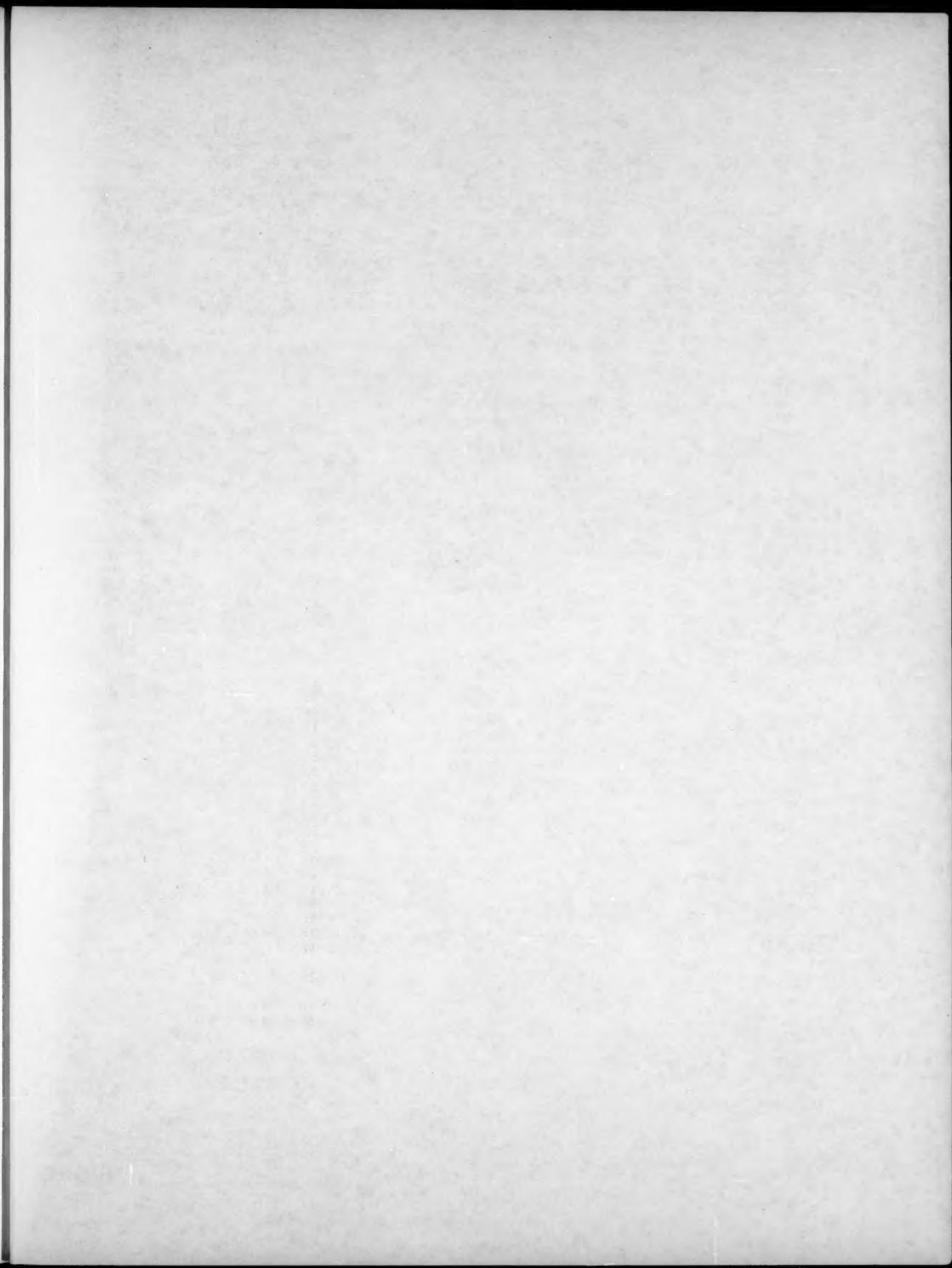
04500197 - 04

ABSTRACT SOURCES

Source	Accession Number	Total
A. Centers of Competence		
AEC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W73-04290 -- 04300 04302 -- 04308 04310 -- 04320 04322 -- 04329	37
Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W73-04230 -- 04253 04387 -- 04392 04394 -- 04410 04412 -- 04420 04545 -- 04546	58
Bureau of Reclamation, Engineering Works	W73-04073 -- 04085	13
Colorado State University, Irrigation Return Flow Quality	W73-03952 -- 03954 03956 -- 03976 03978 -- 03986	33
Cornell University, Policy Models for Water Resources Systems	W73-04274 -- 04277 04354	5
University of Florida, Eastern U.S. Water Law	W73-04452 -- 04475	24
University of Texas, Wastewater Treatment and Management	W73-03987 -- 03995 03977 -- 04012 04014 -- 04018 04154 -- 04163 04165 -- 04166 04278 -- 04280 04282 -- 04289 04421 -- 04447 04449 -- 04451 04476 -- 04484 04486 -- 04488 04490 -- 04494 04496 -- 04499 04547 04549 -- 04550	107
U. S. Geological Survey, Hydrology	W73-03912 -- 03915 03918 -- 03951 04069 04086 -- 04120 04192 -- 04223 04225 -- 04228 04355 -- 04377 04379 -- 04386 04501 -- 04518 04525 -- 04544	179
Vanderbilt University, Metals Pollution	W73-04042 -- 04052 04054 -- 04056 04058 04122 -- 04127	21
Vanderbilt University, Thermal Pollution	W73-04020 -- 04027 04029 -- 04031 04033 -- 04041 04070 -- 04071 04121 04330 -- 04333 04335 -- 04343 04345 -- 04353	45

ABSTRACT SOURCES

Source	Accession Number	Total
B. State Water Resources Research Institutes		
Arizona Water Resources Research Center	W73-03901	1
Colorado Environmental Resources Center	W73-04061	1
Delaware Water Resources Center	W73-03902 -- 03903	2
Hawaii Water Resources Research Center	W73-04062	1
Indiana Water Resources Research Center	W73-04063	1
Michigan Institute of Water Research	W73-03904	1
Minnesota Water Resources Research Center	W73-03905 -- 03906	2
Nebraska Water Resources Research Institute	W73-03907	1
North Carolina Water Resources Research Institute	W73-03908, 04064	2
Oklahoma Water Resources Research Institute	W73-04065	1
South Dakota Water Resources Institute	W73-03909, 04066	2
Utah Center for Water Resources Research	W73-04067	1
Washington Water Research Center	W73-04068	1
C. Other		
BioSciences Information Service	W73-03916 -- 03917 03955, 03977 03996, 04013 04019, 04028 04032, 04053 04057, 04072 04164 04167 -- 04191 04224, 04229 04254 -- 04273 04281, 04301 04309, 04321 04334, 04344 04378, 04393 04411, 04448 04485, 04489 04495, 04500 04519 -- 04524 04548	81
Ocean Engineering Information Service	W73-04128 -- 04153	26
Office of Water Resources Research	W73-03910 -- 03911 04059 -- 04060	4



CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U.S. Geological Survey, U.S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Design and construction of hydraulic structures; weather modification; and evaporation control at the Bureau of Reclamation, Denver, Colorado.
- Eutrophication at the Water Resources Center of the University of Wisconsin, jointly sponsored by the Soap and Detergent Association and the Agricultural Research Service.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Public water supply treatment technology at the American Water Works Association.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Thermal pollution at the Department of Sanitary and Water Resources Engineering of Vanderbilt University.
- Water quality requirements for freshwater and marine organisms at the College of Fisheries of the University of Washington.
- Wastewater treatment and management at the Center for Research in Water Resources of the University of Texas.
- Methods for chemical and biological identification and measurement of pollutants at the Analytical Quality Control Laboratory of the Environmental Protection Agency.
- Coastal pollution at the Oceanic Research Institute.
- Water treatment plant waste pollution control at American Water Works Association.
- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.

Subject Fields

- 1 NATURE OF WATER
- 2 WATER CYCLE
- 3 WATER SUPPLY AUGMENTATION AND CONSERVATION
- 4 WATER QUANTITY MANAGEMENT AND CONTROL
- 5 WATER QUALITY MANAGEMENT AND PROTECTION
- 6 WATER RESOURCES PLANNING
- 7 RESOURCES DATA
- 8 ENGINEERING WORKS
- 9 MANPOWER, GRANTS, AND FACILITIES
- 10 SCIENTIFIC AND TECHNICAL INFORMATION

INDEXES

- SUBJECT INDEX
- AUTHOR INDEX
- ORGANIZATIONAL INDEX
- ACCESSION NUMBER INDEX
- ABSTRACT SOURCES



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